ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS

...-HILL CO.
...LIFORNIA

DECEMBER, 1940

25c a Copy

..a "Plug" for all-year Cheer
THESE NEW ELECTRICAL GIFTS ARE FUN TO GIVE . . . AND FUN TO GET
BETTER SIGHT LAMPS.
AUTOMEAL ROASTER.
COFFEEMASTER.
ELECTRIC CLOCKS.
ELECTRIC TOASTERS.
ELECTRIC IRONS.
SEE THEM TODAY AT YOUR DEALER OR EDISON OFFICE
Edison

Every [illegible] are discovering that practic[illegible]s are appreciated the most . . . and every year the electrical industry is obtaining a larger share of the Christmas business through the concerted advertising and merchandising efforts of the manufacturers, utilities and dealers. This December, Edison's most comprehensive pre-Christmas advertising campaign of recent years will help direct Christmas buying into electrical channels. This should be a banner year for electrical merchandise in Edison territory.

SOUTHERN CALIFORNIA · ALL-WINTER SUN FESTIVAL · 300 EVENTS — COME EARLY

SOUTHERN CALIFORNIA Edison

ELECTRICAL WEST (with which is consolidated The Journal of Electricity), December, 1940. Vol. 85, No. 6. Published monthly by the McGraw-Hill Company of California, 68 Post Street, San Francisco, Calif. Entered as second class matter at the post office at San Francisco under the Act of March 3, 1879. Additional entry as second class matter at the post office at Los Angeles. Printed in U. S. A. Subscription rate in U. S. and U. S. possessions, and Canada, $2 per year; all other countries $3 gold (thirteen shillings). Single copy 25c.
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We Make a Lot of Relays

. . . and We Make 'em Alike

That's Why We Were Able to

REDUCE PRICES 10%

. . . on all G-E standard, normal-speed induction and auxiliary relays, effective November 1, 1940.

Continuous progress in design, a practical and extensive standardization program, and efficient production-line manufacturing methods combine to give you the important saving made possible by these new low prices.

General Electric Company, Schenectady, N. Y.

GENERAL ELECTRIC

Here in the WEST

People

George A. Hill
has been continuously engaged in illuminating engineering and sales work for the past 17 years.

An Electrical Engineering graduate from the Univ. of

Wisconsin in 1923, he became affiliated with Curtis Lighting, Inc., of Chicago.

He left Curtis in 1929 to take charge of Lighting Sales for an electrical wholesaler, The Electric Corp. of Los Angeles, and about two years later organized his own electrical and illuminating business in that city. In 1935, he went to Prescott, Ariz. to organize a Lighting Dept. for The Arizona Power Corp., and since then has served Arizona Power as Lighting Sales Director and Asst. Sales Manager.

P. D. Jennings
relishes intricate mathematics. He has been with Puget

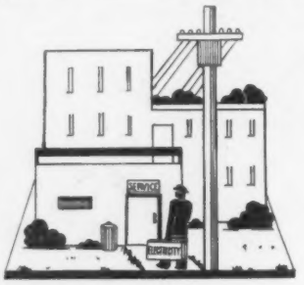
Sound Power & Light 31 years, and an engineer for the company since the formation of its general engineering department in 1935. He is a past secretary of the Seattle Section AIEE.

Recently he startled visitors attending Puget Sound's Hobby Show in Seattle with a carefully worked-out analysis of the probabilities of their *not* winning at Chinese lottery. His article on p. 42 sets forth the method perfected in Puget Sound's engineering department by which that company is enabled to predict its load for a year in advance with exceeding accuracy, and it includes a prediction for 1941.

Preview

Sales Guide

Dealers are beginning to appreciate the brake on their sales that inadequate wiring has become. Often they do have an opportunity to suggest to customers that their



wiring should be modernized if they wish to get full value from the appliances they own. Their salesmen too, can put in effective words that will help to remove this obstacle to future sales. The Sales Guide for January will suggest easy ways in which to drop such hints where they can.

Data Sheets

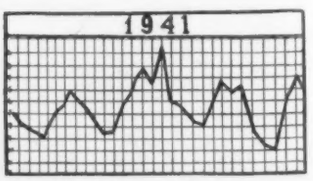
Lighting data sheets, prepared in cooperation with the Pacific Region "H" of the Illuminating Engineering Society, will begin to make regular appearances in ELECTRICAL WEST beginning next issue. These, with the "dope sheet" material of the Electrical Maintenance Engineers, also promised, and the industrial data sheets of the two associations, will supply readers with compact, timely, usable ideas and method material in convenient reference form.

Ground Resistance

In the engineering section next month, H. V. Strandberg, transmission engineer of Seattle City Light will present the results of extensive investigation of tower footing resistance, covering conditions encountered in a variety of soils in the Northwest.

Forecast

Already under way is the accumulation of data for the February forecast issue. Con-



sisting of direct reports from all quarters of the West, it will give the first clear, complete picture of what electrical activity will be like in the West through 1941.

Pages

Ancient Indian Rituals Go Fluorescent 31
By GEORGE A. HILL—How the Smoki organization in Arizona has gone in for "black light."

British Columbia Has a Boom 34
Canadians up north are buying major appliances heavily despite their country in a state of war.

Predicting Load with "No-Growth Curve" 42
By P. D. JENNINGS—System perfected by Puget Sound system yields accurate monthly data for year ahead.

Lightning Geography Is Key to Protection 45
By W. C. SMITH and A. F. AYRES—Studies of lightning distribution in California, and protection economics.

ABC's of Relays—Part 4 47
By E. B. KIPP—High-speed impedance unit exemplifies the high-speed features of most designs.

Floods of Daylight for the Pineapple Packers 50
The installation of over five hundred fluorescent lights in the Hawaiian Pineapple Co. cannery.

New Products 4
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Scanning the Magazines 24
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News of the Industry 66
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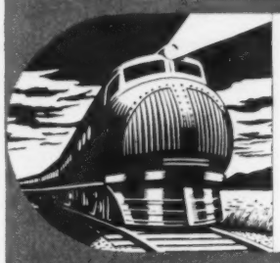
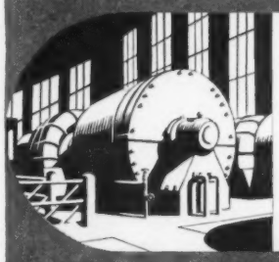
Cover: Colorfully radiant is the Mulholland Memorial Fountain in Los Angeles lighted by a Westinghouse underwater lighting system.

BRUSH PERFORMANCE *at its best*



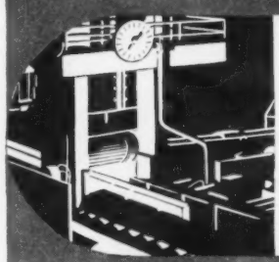
TRANSPORTATION

There is a "National" Brush grade for every type of transit service, including the heaviest duty service on modern, high speed equipment.



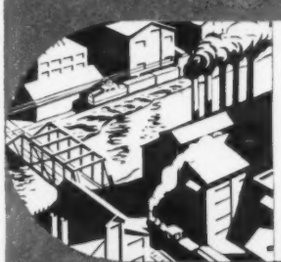
POWER PLANTS

"National" brushes have established a reputation for reliability and outstanding performance on power generating and substation equipment.



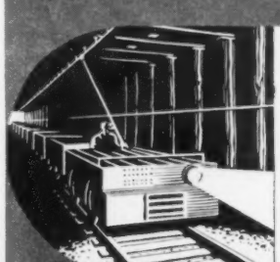
STEEL MILLS

"National" brushes give dependable and economical performance under the varied and exacting demands of modern steel mill production methods.



FACTORIES

Minimum upkeep expense on commutating equipment is one reason for the preference given "National" brushes by factory maintenance men.



MINES

Many mines have improved performance of their electrified equipment by adopting "National" brushes for power, operating and transportation units.

WITH

NATIONAL

TRADE-MARK

CARBON BRUSHES

The performance characteristics resulting from careful study of the requirements of all types of electrical equipment, extensive research facilities and years of manufacturing experience enable users of "National" brushes to obtain maximum reliability and economy of operation.

★ ★ ★

SPECIAL FEATURES AVAILABLE ON "NATIONAL" CARBON BRUSHES

- Glass Fabric Shunt Insulation
- Lead Coated Shunt Cable
- Resilient Pressure Pads

★ ★ ★

The engineering staff of National Carbon Company, Inc. will assist you in the selection of grades designed to give best performance on your equipment.

WRITE TO OUR NEAREST BRANCH SALES OFFICE

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

UCC

CARBON SALES DIVISION, CLEVELAND, OHIO

General Offices: 30 East 42nd Street, New York, N. Y.

Branch Sales Offices

New York . Pittsburgh . Chicago . St. Louis . San Francisco

RUBBER COVERED POWER CABLES • BUILDING WIRE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

ARMORED CABLE • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • VARNISHED CAMBRIC

CRESCENT

Helps You Build

POWER for DEFENSE

CRESCENT'S large, complete and up-to-date facilities for the manufacture of all types of electrical wires and cables are meeting the great demands for industrial plant expansion for national defense.

These facilities are backed by over 50 years experience and skill in the manufacture of

- POWER CABLES
- CONTROL CABLES
- SIGNAL CABLES
- PORTABLE CABLES
- BUILDING WIRES

Ask Your Electrical Wholesaler for

CRESCENT Insulated Wires and Cables

CRESCENT INSULATED WIRE & CABLE CO. INC.

TRENTON, NEW JERSEY

LOS ANGELES
Tri-State Supply Corp.
544 S. San Pedro St.

SAN FRANCISCO
Hodges & Glomb
1264 Folsom St.

KANSAS CITY
W. F. Howe & Co.,
2627 McGee St.

CRESCENT ENDURITE SUPER - AGING INSULATION

NEW PRODUCTS

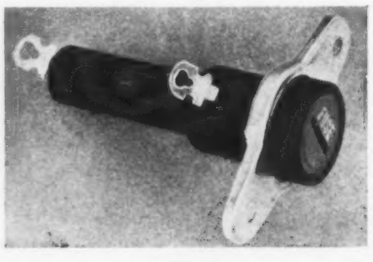
Kelvinator (1201)

Announcement of a special Kelvinator Christmas refrigerator, a full-featured 6½ cu. ft. model which will carry a suggested delivered-in-the-kitchen price of $149.95 anywhere east of the Rocky Mountains, was made this week by Frank R. Pierce, general sales manager of the Kelvinator Division of Nash-Kelvinator Corp. The new Christmas model is a de luxe-equipped refrigerator with many special features. Included are two glass-topped vegetable crispers, sliding and

adjustable shelves, twin dome lights and a spacious sliding porcelain Cold Chest with separately-suspended porcelain cover. Kelvinator's new pop-out type ice tray, which has a special lever for releasing both trays and cubes, is incorporated in the Christmas model. There are four of these trays, which provide a total ice capacity of 64 cubes, or eight lb. at one quick freezing.

Alden Fuse Holder (1202)

A new fuse holder has been developed by Alden Products Co., designed to overcome complaints from the Underwriters' Laboratories that the ordinary holder with the single nut mounting would become loose from the panel when unscrewing the front button to replace the fuse. This type mounts with either eyelets, rivets, or screws, lending itself



to high production methods of assembly. Fuse posts are supplied with an extractor spring in the base of the holder which will eject the fuse even though the glass may have become broken.

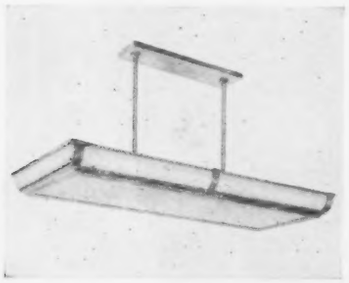
AT this season—and every season—R&IE equipment on your system is assurance of continuous day and night service. This is the basis on which the friendly attitude of your customers is founded.

May your Holidays be merry and your New Year most Prosperous.

RAILWAY AND INDUSTRIAL ENGINEERING CO.
GREENSBURG, PA.

Du Pont Louverglas (1203)

Louverglas, a new type sheeting developed in Plastacele cellulose acetate plastic made by the du Pont Co., is used in this pendant ceiling fixture illustrated below. Very thin, parallel translucent louvers or "slats" run through the depth of clear transparent sheeting at right angles to the surface. This material, intended primarily for fluorescent lighting fixtures, is said to be the first to combine the efficiency of direct lighting with the comfort of indirect lighting.



Service Control (1204)

A new line of 100 amp. pull-out type service control is introduced by Cutler-Hammer, Inc. The switch is available with or without branch circuits, the 100 amp. pull-out type being rated at 230 volts a.c. It is also available with two 60 amp. pull-outs; and 4, 6, or 8 plug fuse circuits rated 115/250 volts. Among the noteworthy features are dead-front construction; bakelite switch base; 3-wire grounded solid neutral; new type solderless lugs on all 60 and 100 ampere terminals; easy-tight wire holes on plug fuse terminals; convenient fuse testing facilities; slots in cover and case for sealing purposes; plenty of wiring space.

Protective Lighting Unit (1205)

A new type of protective lighting unit has been introduced by The Union Metal Mfg. Co. It is designed especially for industrial plants where tower truck maintenance equipment is not available. The assembly consists of a modern high intensity luminaire mounted on a tapered steel Monotube pole. Luminaire is equipped with a disconnecting orientating cutout which permits it to be lowered for relamping, cleaning, etc., thereby eliminating the need for a tower truck.

Teletalk (1206)

A complete, compact, specially-designed Teletalk system for lunch counters has been disclosed by Webster Electric. The system consists of a microphone, amplifier and speaker, providing instantaneous one-way communication from counter to kitchen. Up to six microphones and four speakers may be used on one amplifier. The amplifier unit is housed in a sturdy metal case which may be side-mounted on a wall or placed on a shelf in any out-of-the-way spot. An on-and-off switch, pilot light and volume control are provided; volume may be adjusted as required.

Bakelite Push Button (1207)

An Illuminated Bakelite push button that eliminates hunting for house numbers at night has been developed by the Eagle Electric Mfg. Co. It is ideal for private homes, doctors, dentists, lawyers, for use on individual apartment doors, etc. Easily installed as an ordinary button. No extra wiring necessary. Has provisions for illuminating name, house number and push button. Name and house number are written on translucent plate by the owner. Small lamp inside illuminates the plate and also the transparent push button. Operates on all bells and chimes from 6 to 14 volts. Also furnished in higher voltages upon request. Fastening wood screws, hidden under name plate prevents theft.

Fluorescent Luminaire (1208)

A new ornamental fluorescent luminaire, suitable for general commercial lighting installations in offices, schools, stores, and public buildings, is presented by Westinghouse. Available with three types of diffusing media for different light distribution requirements, the unit uses 4 40-watt, 48-in. fluorescent lamps, either white or daylight or combinations of both. With a louver bottom, 30% of the light is directed downward, 70% upward; with a clear ribbed glass bottom panel, 25% of the light is down, 75% up; and with decorated ribbed glass, 22% of the light is down, 78% up. A rectangular steel ceiling plate supported by knurled rings, slips down over stems to afford free access for wiring and installation. One-piece seamless brass stems have an adjustment permitting easy levelling of the fixture. The frame is heavy steel. Side panels are curved Monax glass. Bottom panel may be equipped with either louvers, or the two types of ribbed glass.

Transformers for Confucius!

In the land of Confucius, near Shanghai, China, three Gardner Custom-Built Transformers are being used on an electric furnace installation.

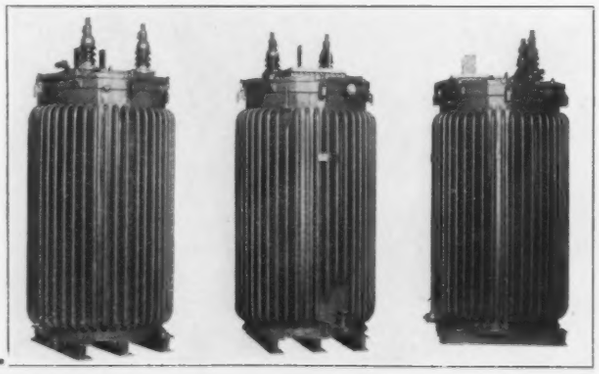
The application of our equipment in widely separated areas—China, Hawaii, and throughout the western United States—is proof of users' confidence that Gardner Transformers will give trouble-free operation and economical performance.

Gardner Electric Manufacturing Co.
4221 Hollis St. Emeryville, Calif.

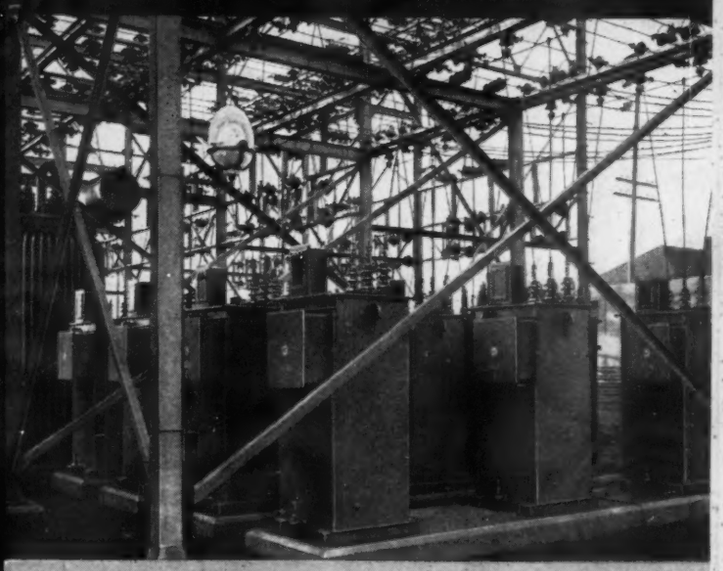
GARDNER

MAYDWELL & HARTZELL
INCORPORATED
Engineers and Manufacturers' Representatives
SAN FRANCISCO - PORTLAND - LOS ANGELES - PHOENIX

Installed in the vicinity of Shanghai are these 3 - 250KVA Transformers, 6600 to 120 Volts, 50 Cycles, Single Phase, with taps at 110 and 130 Volts.



ARE YOU USING 21,000 EXTRA KVA *to Excite your Regulators?*



LOW EXCITING CURRENT of these Allis-Chalmers 5/8% Half-Cycling Step Regulators enables this western utility to release more capacity of their system for pay loads.

Mid-Western Utility Engineer Finds that Allis-Chalmers Step-Type Regulators Cut Exciting Current for Low Voltage Single-Phase Feeder Regulators. Find Out How You Can Get Smoother Regulation at Lower Cost!

Are you using 21,000 extra kva to excite your feeder regulators? Perhaps you are and don't realize it! Neither did a midwestern utility engineer until he checked his system and found that he was carrying that much useless burden.

This system used a large number of regulators of the older type. Had Allis-Chalmers regulators been available at the time, this system could have cut exciting current 21,000 kva!

Think what that 21,000 kva means in terms of extra burden on your system! That's extra cost just to supply wattless current! To release this capacity for pay loads would have required 21,000 kva of capacitors—about $160,000 additional investment!

Not One Contact Replaced!

That engineer was shown how he could also save on maintenance . . . and you can save, too! All moving parts in Allis-Chalmers Regulators are completely immersed in oil . . . nothing to lubricate! Extra large contacts of special non-arcing alloys just won't wear out! At the time this advertisement was written, *there has not been a single contact replaced on Allis-Chalmers regulators, due to deterioration from normal operation, since they were placed on the market over five years ago!*

With 5/8% Half-Cycling steps you get extra smooth regulation! And that smooth regulation means increased customer satisfaction . . . increased revenue for you!

Make sure you're not buying regulating equipment that increases the costly burden of wattless current! Bulletin 1183-A gives complete details about smoother regulation at lower cost . . . with Allis-Chalmers Step-Type Feeder Voltage Regulators. Write for your copy today!

1043

INCREASE YOUR REVENUE WITH ALLIS-CHALMERS 5/8% HALF-CYCLING STEP REGULATORS

TRANSFORMER DIVISION

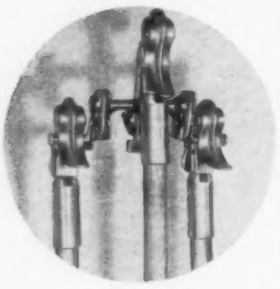
ALLIS-CHALMERS

MILWAUKEE·WISCONSIN

"There's nothing too good where life is at stake"...

Protect linemen with TIPS grounding equipment...

POSITIVE CONTACTS



Linemen are entitled to the extra protection of Tips Grounding Equipment—originally designed to replace hazardous grounding chains that do not provide positive contacts.

Tips grounding sets clamp tight to the conductors and snap on quickly, eliminating the necessity of "feel" for the conductor and possible arcing in case the line should be accidentally energized.

Our new catalog of Tips maintenance equipment will show you a complete line of grounding sets like those pictured here. A set to meet every requirement and to fit every budget. Either mounted on poles or with eye screw clamps. Linemen will welcome your selection of this more positive grounding protection.

A·B·CHANCE CO. CENTRALIA MISSOURI

Colt Motor Starter (1209)

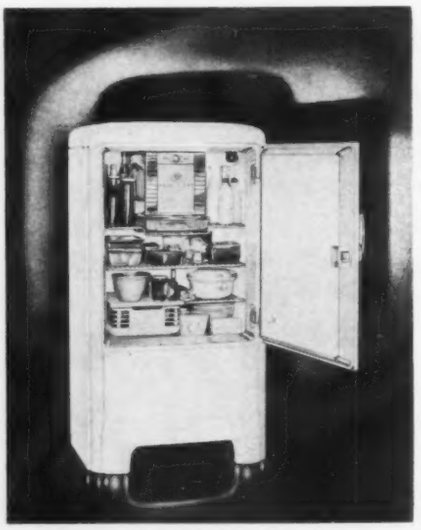
The new Colt Magnetic Motor Starters are designed for across-the-line starting of single and polyphase squirrel cage induction motors, and as primary control for wound rotor induction motors. One important feature is the three-point ball-bearing suspension of the movable electro-magnet, assuring a floating action that minimizes friction and guides contacts smoothly into correct alignment. The magnet operates vertically and cannot close accidentally by vibration or

shock. Other features include the double break rounded silver-to-silver contacts . . . layer wound magnet coils with paper section construction, fully taped, impregnated and baked . . . the "E" shaped magnet designed to give a strong pull with low power consumption . . . easily removed contacts and magnet coils . . . ample wiring space and plenty of knockouts.

Frigidaire Christmas Model (1210)

Designed especially for promotion during the holiday buying season, Frigidaire Division, General Motors Sales Corp. presents a fully fitted six cu. ft. Frigidaire which carries a Zone B retail price of $118.50. Among the extra features listed for this low-priced Christmas model are its full six cu. ft. size, larger refrigerating unit, ice trays of the Quickube type, double width dessert tray, freezer door, sliding hydrator, safety-cycle defroster, gray door trim, plus basic features identified with Frigidaire refrigerators.

Added to Frigidaire's refrigerator promotion during the Christmas shopping period will be two electric range models in both low and medium price brackets.



THERE ARE "BESTS" IN EVERY INDUSTRY

IN ELECTRICAL APPLIANCES IT'S

Sunbeam

Automatic MIXMASTER
Double Automatic IRONMASTER
SILENT AUTOMATIC TOASTER
Automatic COFFEEMASTER
SHAVEMASTER
FLAT TOASTER • FAN HEATER
GLASS COFFEE MAKERS
WET-PROOF HEATING PAD
MASTER PLUG & CORD SET
WAFFLE BAKER

MADE AND GUARANTEED BY
CHICAGO FLEXIBLE SHAFT COMPANY
5600 West Roosevelt Road, Chicago, Illinois
316 Commercial Street, Los Angeles, Calif.
224 S. W. Temple Street, Salt Lake City, Utah
557 Market Street, San Francisco, Calif.
50 YEARS MAKING QUALITY PRODUCTS

How We Help the Professions to Save Valuable Time

You and your assistants are under constant pressure for time. We can help you in a real way with our Bank-by-Mail Service, enabling you to do most of your banking when convenient, day or night, right in your office. Why not open an account today, by mail?

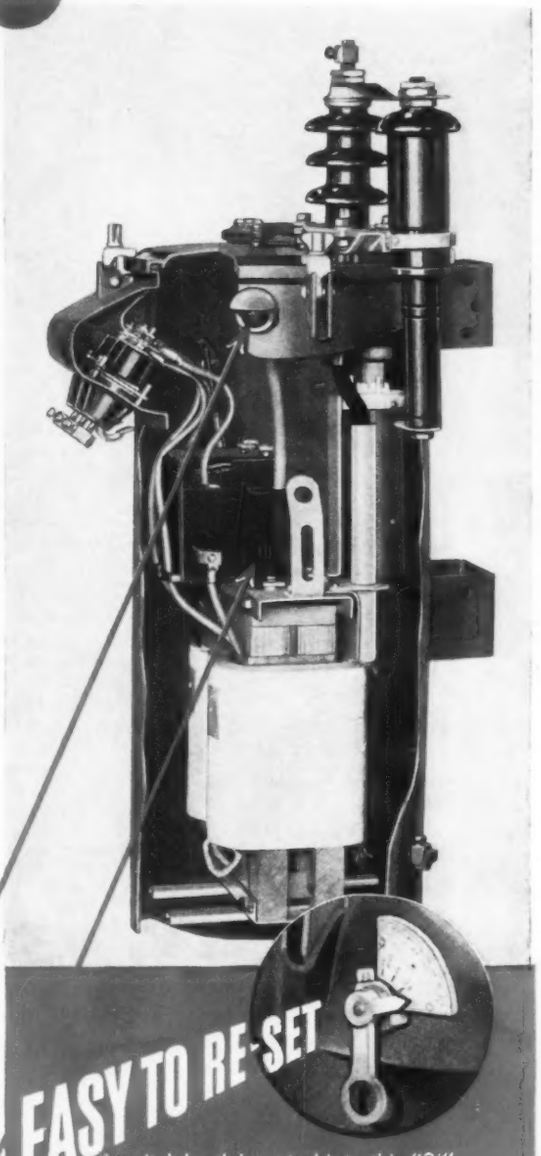
CROCKER FIRST NATIONAL BANK
OF SAN FRANCISCO
California's Oldest National Bank
Member Federal Deposit Insurance Corporation

THE "3i" TRANSFORMER

Impulse and Interruption Immune

PROTECTS ITSELF

★Against lightning, against short circuits, against overloads, the L-M "3i" Transformer protects itself completely, without the aid of external protective devices. Its De-Ion Gap makes the "3i" immune to lightning damage. A built-in circuit breaker makes it immune to burnouts from shorts or heavy overloads. And the "3i" Overload Signal Light flashes on whenever overload is dangerously near, giving you visible warning, saving you costly load surveys. "3i" Transformers *combine* these self protective features with the basically sound L-M Transformer design. That is your additional insurance of trouble-free service and low maintenance cost in addition to self protection.



"3i" WARNING LIGHT ★

flashes on automatically when overload danger nears, is easily visible from ground. Continues to burn if overload is sufficient to trip the circuit breaker, cutting transformer off the line.

"3i" CIRCUIT BREAKER ★

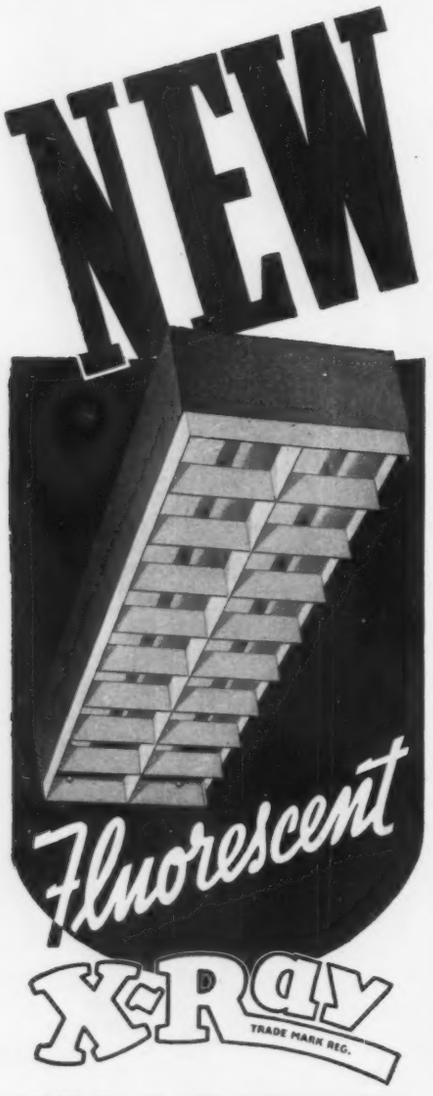
cuts transformer off the line automatically if burnout or overload threatens serious damage. Operation automatically controlled by temperature of the transformer coils.

EASY TO RE-SET

A switch hook inserted into this "3i" Re-Set Handle (conveniently placed on the tank) restores the "3i" to service after the circuit breaker has operated. Enables you to re-set the "3i" quickly from the ground.

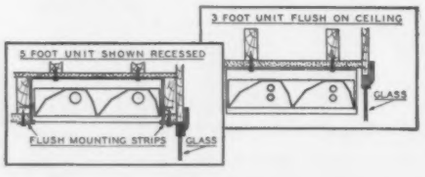
LINE MATERIAL COMPANY

MAIN OFFICES · MILWAUKEE · WISCONSIN



SHOW WINDOW LIGHTING UNITS

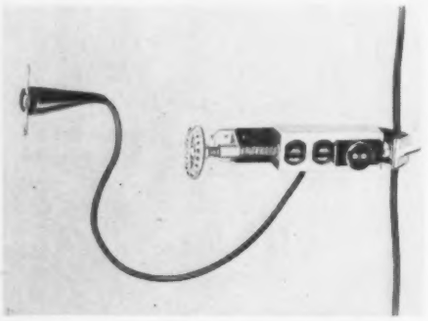
Punch the light down on the merchandise . . . use 3 foot and the new 5 foot lamps in polished Alzak reflectors. Specially designed for *controlled* lighting. Write today for your copy of descriptive folder.



Curtis
LIGHTING
1123 West Jackson Blvd.
NEW YORK CHICAGO TORONTO

Tap-off Receptacle (1211)

This new Emergency Tap-Off Receptacle made by line material makes power for lights and electric lead pots quickly and easily available in manholes and other out-of-the-way spots. The device is easily connected to any rubber insulated secondary. Its adjustable serrated clamp is first attached to the ground. Its contact point is then screwed into position, quickly piercing the rubber insulation and making contact with the secondary wire. After using and removing the receptable, you need only tape up that section of the insulation which has been pierced. Two receptacles are available on the new unit, giving you two points of access to 110-volt service for electric lead pots or lights. The receptacle is fused for 30 amp., and its fuses are very easily and quickly removed and replaced.



LaSalle Shade (1212)

This shade, designed by La Salle Lighting Products, Inc., is not limited to beam lights and single socket drop cords—handy size permits the use of two or three shades on one fixture, depending on the number of bulbs. It will even fit fixtures with bulbs that are set at an angle, since the clip attachment is firm enough to hold the shade horizontal.

Reclosure Equipment (1213)

A standardized automatic reclosing equipment for use with small outdoor oil circuit breakers of from 50,000 to 250,000 kva. interrupting capacity, 400-600 amp. at 7500 v., and 600-1200 amp. at 15,000 volts a.c., is now offered by Westinghouse. The new equipments utilize the time-tried RC recloser, and include complete breaker accessories, such as current transformers, breaker trip coils, rectox, etc., and a control cabinet and panel completely wired and mounted on the breaker frame.

G-E Double-Tub Washer (1214)

Important refinements in the nature of a temperature indicator, a washing timer, and a spring-equipped cord reel to solve one of the prevalent irritations of washday are featured in a new double-tub washer of the spin-basket type, model AW-1012, that has just been introduced by General Electric appliance and merchandise dept. A newly-designed spin-basket tub cover which functions as a drainboard also adds to the utility of the new machine.

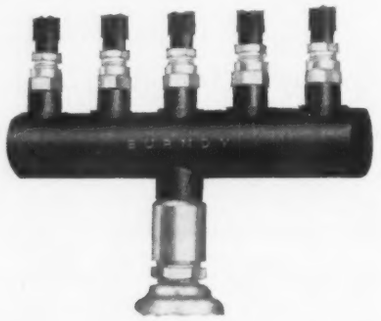
Tub capacity of the washer is nine lb. of dry clothes and 18 gals. of water. It is equipped with the new type of activator, made of aluminum alloy. The bottom of the separate spin basket is die-cast zinc, and the upper section of perforated steel which has been given a four-coat hot tin finish. It is driven by an automobile-type clutch and equipped with an automatic brake. The spin-basket is designed to damp-dry clothes efficiently and safely, including such bulky articles as feather pillows and blankets. The tubs' smooth finish protects both fabrics and the operator's hands.

Westinghouse Luminaire (1215)

A semi-indirect luminaire suited for general illumination of commercial buildings such as offices, banks, restaurants, stores and schools is introduced by Westinghouse. These units, the type PL-500, are available in 300-500 watt size only. The luminaire has a drawn brass canopy supported by a knurled ring on a swivel hickey. The stem is one-piece seamless brass tubing. One-piece porcelain socket has all metal parts nickel plated except the polarized brass terminal. A drawn brass husk enclosed the socket. All hangar parts are finished in "satin chrome."

Burndy Stud Connector (1216)

The accompanying illustration shows the Burndy Type ZMDZ Insulated Stud Connector for joining several cables to smooth or threaded stud. The cables are each gripped by compression cone clamping elements and the stud also is gripped by a compression cone, suitably threaded to screw onto the stud. Insulation of the connector is completed by taping the exposed metal parts or Burndy can furnish insulating sleeves which eliminate the necessity of taping. This connector is especially suited for stud connections in underground distribution systems, at network protectors, or on the secondary terminals of underground transformers. It is available for joining various sizes and numbers of cables.



Hotpoint Ironer Table (1217)

To aid Hotpoint retailers in promoting the Priscillaette Portable Ironer, the Hotpoint Sales Promotion Dept. has introduced a new all-steel table and chair, available singly or together at low cost. The table, finished in sparkling white, is exactly the right height for comfortable ironing. Its lower shelf provides plenty of leg room, when ironing, as well as storage space for the Priscillaette, when not in use. With the ironer on its storage shelf, the table-top provides 30½ x 15½ in. of useful work surface. The ironing chair is of modern tubular steel. Seat and back are of steel, finished in flashing red baked enamel. It provides comfort and back-support for the ironer-operator, contributing immeasurably to ironing efficiency.

EXTRA! INSULATOR NEWS EXTRA!

PYREX INSULATORS USED BY LEADING COMPANIES IN ALL 48 STATES!

126 Leading Utilities and Private Companies Choose Pyrex Brand!

From coast to coast—from Canada to the Gulf—top-ranking companies are going strong for PYREX brand Insulators!

Since 1923, these remarkable products of Corning Research in glass have proved their superiority in heat, cold, rain and snow! Today, they are standard equipment with 126 big public utilities and private companies in each of the 48 states!

PYREX Suspension Insulators are outstanding for features unequalled in competitive products: (1) Mechanical and electrical strength well above average, (2) superior long-time strength, (3) higher impact-resistance, (4) greater resistance to temperature changes! PYREX Pin Type Insulators, too, are tops in thermal, mechanical and dielectrical performance!

One of Corning's twenty-one agents lives near you. Phone or write him today for complete information — or if you prefer, just address Corning Glass Works, Insulation Division, Corning, New York.

LIST OF FAMOUS USERS READS LIKE "WHO'S WHO" OF AMERICAN POWER AND INDUSTRY!

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Bangor Hydro Electric
Alaska Juneau Gold Mining Co.
Alaska Electric Light & Power Co.
Atlantic City Electric Co.
Kansas Power Co.
Kingsport Utilities, Inc.
Long Island Lighting Co.
Louisville Gas & Electric Co.
Luzerne County Gas & Electric Corp.
Metropolitan Edison Co.
Michigan Public Service Co.
Narragansett Electric Co.
New Bedford Gas & Edison Light Co.
New England Power Association
Pacific Gas & Electric Co
Aluminum Company of America
California Public Service Co.
Columbus & Southern
West Penn
Plymouth
Electric Co.
San Diego Consolidat
Gas & El
Worcester Suburb
Electric Co.
Deer River Power Co
Erie Railroad Co.
Jersey Central Powe
& Light Co.
Kentucky & West
Power Co.
Northern Pennsyl
Power C
Union Powe
West C
Altoona
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Western Reserve Power
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Co.

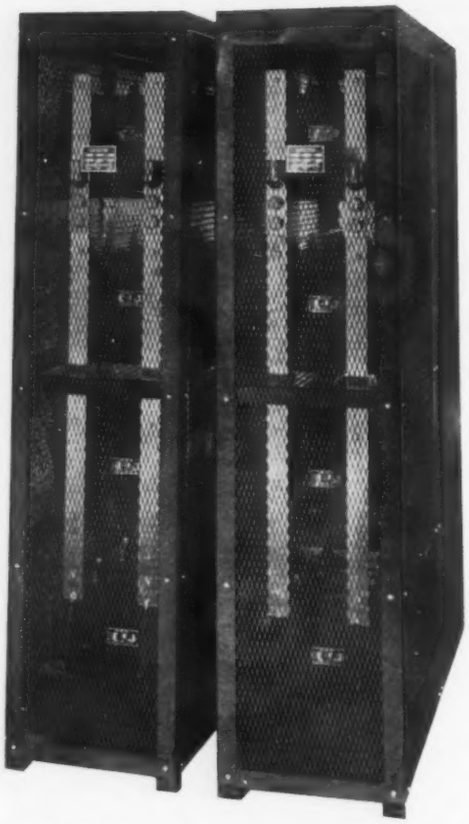
CORNING *means* Research in Glass

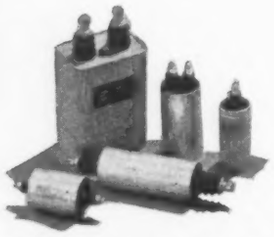
Corning Lighting Glassware BRAND

CAPACITORS FOR EVERY INDUSTRIAL NEED

INDOOR AND OUTDOOR RACKS - - POLE TYPE CAPACITORS - - DUST TIGHT UNITS

FAST CAPACITORS





TWO 300 KVA 240 CYCLE 460 VOLT INDOOR RACK CAPACITORS AND A GROUP OF HIGH VOLTAGE UNITS IN SEVERAL STYLES ILLUSTRATE SOME OF THE MANY TYPES MANUFACTURED BY

John E. Fast & Co.

CAPACITOR SPECIALISTS FOR 21 YEARS

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West Coast Representatives:
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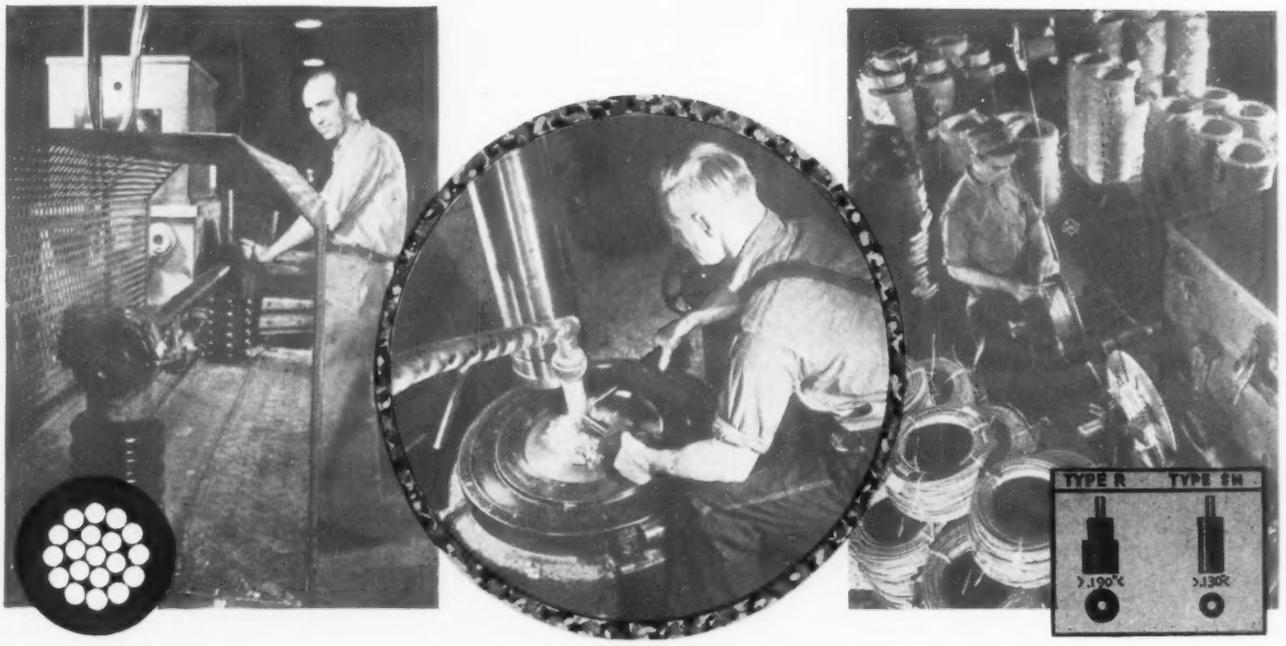
REDUCE LINE LOADS - - BETTER VOLTAGE REGULATION - - SMALLER POWER BILL

CAPACITORS BACKED BY LONG EXPERIENCE



BETTER PROTECTION for rubber insulation—a bonded sheath of Okoprene (made of neoprene) resists oil, chemicals, ozone, abrasion, sunlight and is non-inflammable. Applied to Okonite, Okolite, or Okosheath as required by service conditions. Braids or other fibrous coverings are eliminated.

BETTER LEAD SHEATHS for Paper Cables — by means of the Hill Standpipe and "stabilized" lead, sheaths are made free from laminations, oxide inclusions and flow lines, contain no "critical" region and give longer service. Such stabilized lead sheaths are uniform from end to end.

GREATER CAPACITY in existing conduits—Hazakrome Type SN synthetic insulation for small diameter building wire has been developed for rewiring existing raceways under the 1940 N. E. Code. When Hazakrome is used the capacity of existing conduits can be doubled or even tripled.

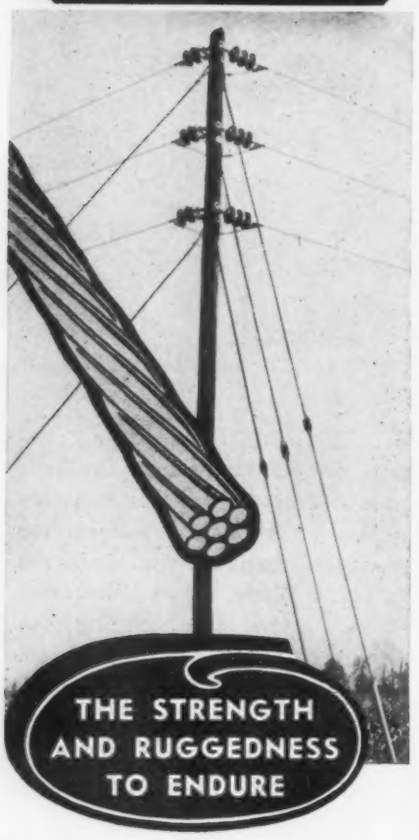
MEN AT WORK

in electrical industries everywhere, have profited by these three major contributions introduced during the past year by men at work in Okonite laboratories and plants. These developments have opened up new opportunities for both extension and replacement work — by providing safer, better and more economical service from insulated wires and cables. For further details concerning these new products and their application write The Okonite Co., Passaic, N. J., offices in principal cities.

OKONITE
Insulated Wires and Cables

OKONITE QUALITY CANNOT BE WRITTEN INTO A SPECIFICATION

Crapo
GALVANIZED STEEL
STRAND
Guy and Messenger



ALL the strength and durability practical needs require are combined—with definite economy—in *Crapo* Galvanized Steel Strand.

The superior tensile strength and ruggedness that only steel can provide .... the heavy, ductile, tightly-adherent protective zinc coatings .... the ability to last beyond the normal replacement period .... the comparatively low first cost of the material .... low maintenance expense .... are all significant factors in the selection of *Crapo* Galvanized Steel Strand for the more important construction jobs.

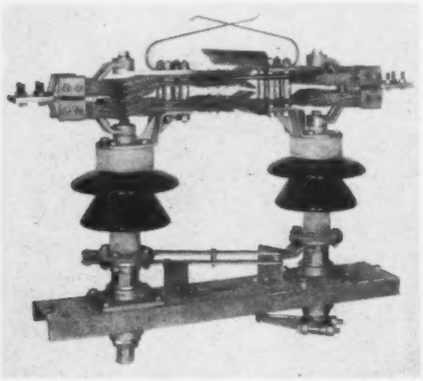
Crapo Galvanized Steel Strand is readily available in all standard grades and sizes from representative jobbers.

Crapo Galvanized Products also include *Crapo* HTC-130 and HTC-80 Steel Conductors (Solid and Stranded 3-Wire), Construction Wire, Tie Wire and Ground Wire.

INDIANA
STEEL & WIRE CO.
MUNCIE, INDIANA

Center Break Switches (1218)

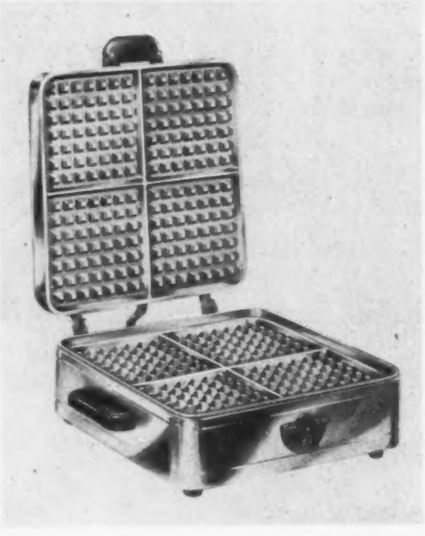
Space factor is often important. For this reason, two-insulator horizontal center-break switches are advantageous for group switches. Overall length is less than three-insulator types, and shorter blade permits closer phase spacing than two-insulator single horizontal break switches having blade full length between insulators.



This 2000 ampere, 23 Kv Type "PM-22" switch, manufactured by Delta-Star Electric Co., is easy to operate due to both blade portions opening on same side of channel base, causing a combined shearing and twisting action for breaking ice or corrosion.

Automatic Waffle Maker (1219)

A new automatic waffle-maker has been put on the market by Chicago Flexible Shaft Co. This Sunbeam grid turns out four waffles at once, and has an 80-in. overall baking area. It is fully automatic with an indicator light that tells when the current is on—when the



grids are at the correct non-stick heat to put in the batter—and when the waffle is baked. You can set this waffle-maker for light, medium or dark waffles. An overflow shield built into the lower grid prevents as much as 50% batter from running over the sides.

Block Hook Snaps (1220)

Automatic block hook snaps have been developed by Ned Licht, San Francisco manufacturer, for Nos. 3, 4, 5, 6 or larger blocks. They are designed for working loads up to 12,000 lb. Ease of operation, long life, saving of taping costs and time and safety factor are advantages of these units.

JEFFRIES

TRANSFORMERS

BUILT TO ORDER
IN A HURRY!!

When you are installing or re-arranging—and need a special transformer to exactly match your requirements—call on us. We can deliver in a week to 10 days.

Specify scattered transformers to eliminate duplicate conduit runs and save on power costs.

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles, Calif.

Speed Up
ANCHORING
JOBS ★

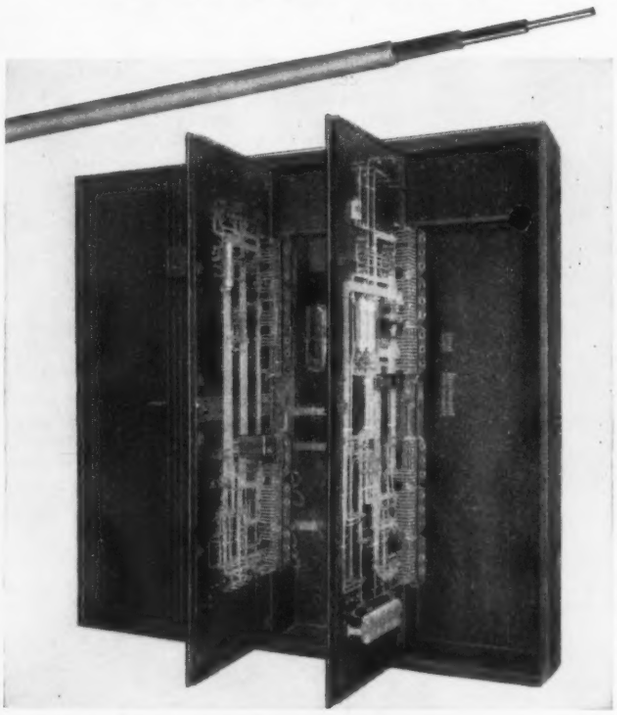
EVERSTICK
ANCHORS...

Speed and ease of installation are features that crews and engineers appreciate in Everstick Anchors. Nut housing locks, anchor firmly on rod—entire unit is installed and expanded in a minimum of time. *Write for new bulletin.*

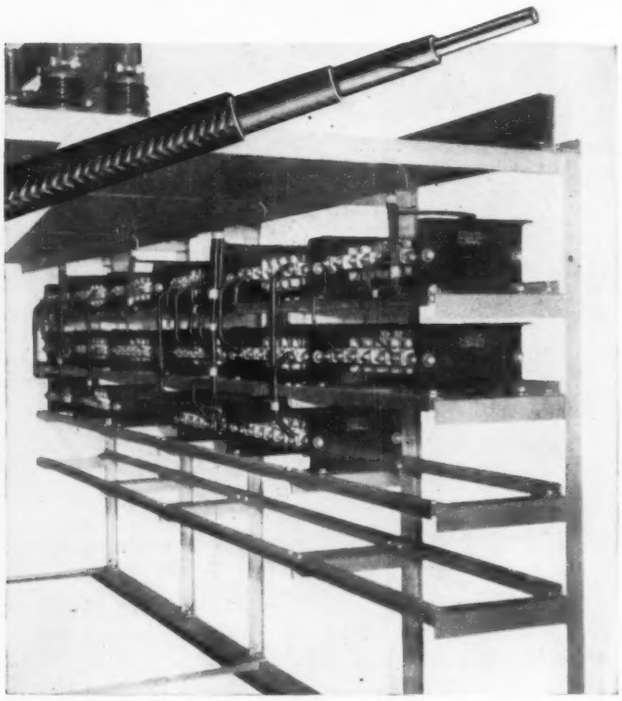
EVERSTICK ANCHOR CO.
FAIRFIELD, IOWA

WIRES AND CABLES BUILT TO HANDLE SPECIALIZED JOBS

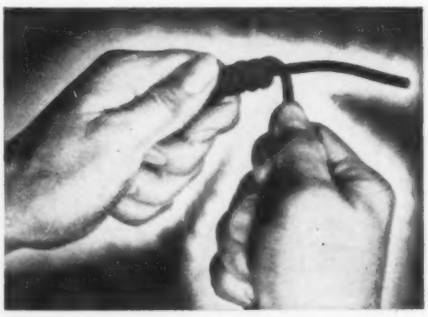
YOU'LL FIND THEM IN THE G-E DELTABESTON LINE



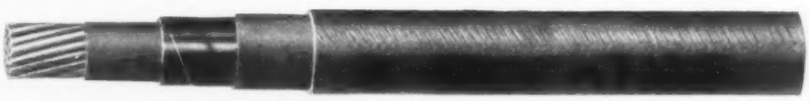
DELTABESTON SWITCHBOARD WIRE
Won't burn—Waterproof—Extremely flexible—Cuts wiring time—Facilitates installation due to smaller over-all diameter—High dielectric strength due to synthetic insulation—Takes sharp bends easily, without harm to insulation.



DELTABESTON RESISTOR CABLE
Outstanding heat resistance—Easy to work with—Tinned copper conductor—Felted, asbestos insulation, flame-, heat-, moisture-resisting—Tough asbestos outer braid.



DELTABESTON FIXTURE WIRE Highly purified asbestos sheath "felted" on to flexible copper conductor—Great resistance to high temperatures in hot sockets and pendants—Hot wax impregnation for moisture resistance—Polished wax surface for easy pulling—Easy stripping—Uniform diameters.



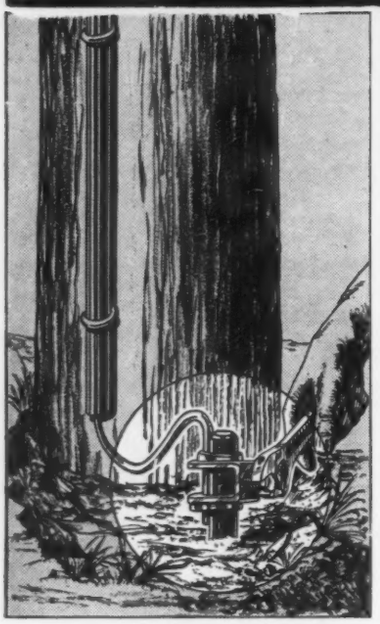
Deltabeston Power Cable Easy to work with—Great resistance to heat, flame, moisture, oil, caustic substances, and abrasion.

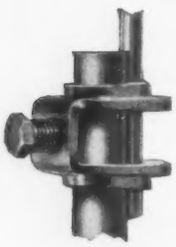
Deltabeston Wires and Cables are sold by the Graybar Electric Company and by all General Electric Merchandise Distributors.

Why don't you send for your copy of the complete Deltabeston Catalog? Write General Electric Co., Section Y-0232, Appliance and Merchandise Dept., Bridgeport, Conn.

GENERAL ELECTRIC

modernize
YOUR
DISTRIBUTION
PRACTICE—





RELIABLE
GROUND
ROD
CLAMPS

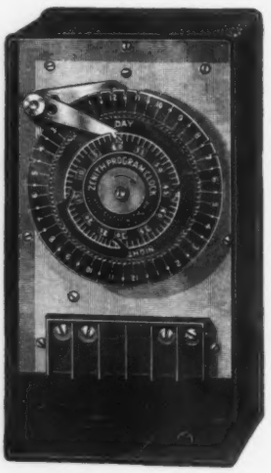
Still out
in front.

The first low price efficiently designed Ground Rod Clamp still offers a fine thread screw to apply a really high pressure joint, Everdur material throughout, and a body that springs slightly under stress so it will not vibrate loose. Hollow head set screws when specified.

Reliable
ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE - CHICAGO, ILLINOIS

Zenith Program Clock (1221)

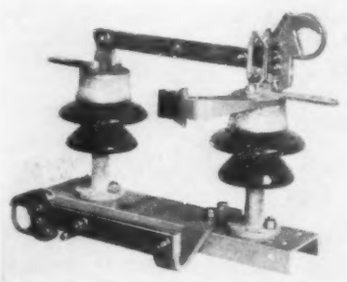
Two new Synchronous Program Clocks for operating time signals are now being manufactured by Zenith Electric Co. These clocks have a large, legible 24-hour dial and a one-hour dial cam. Pointers, connected to a contact arm, ride the dials and permit the contact arm to fall only when preset time is reached. These units are operated by heavy duty synchronous motors, and contact arrangements are such that absolute accuracy



is assured. Contact can be so arranged as to operate a signal either in one ring or a coded ring, or for a definite duration of time, from 2 to 6 sec. Units are compact and enclosed in dust-proof case.

Grounding Blade (1222)

For special applications, a new grounding blade for application to single pole or stick-



operated disconnecting switches has been developed by the Pacific Electric Mfg. Corp.

Mercury Switches (1223)

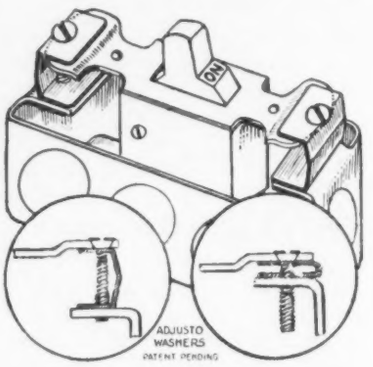
To meet the continual demand for larger electrical capacities in switches with smaller overall mechanical dimensions, Durakool, Inc., offers two radically new mercury switches. Both switches have new and novel internal construction characteristics that enable them to carry substantially greater currents than the regular Durakool Switches with the same dimensions. A standard A-5 Durakool Mercury Switch is rated for 200 watts a.c. lamp load at an operating speed not to exceed 20 times per min. The A-5M, although having the same physical dimensions as the A-5, has successfully withstood 750,000 operations on a 500 watt a.c. lamp load at an operating speed of 5 times per min. 24 hrs. a day. It has also taken 50,000 operations on a 1,000 watt d.c. lamp load at a rate of 25 times per min. The performance of the A-10Z is equally impressive when compared to a standard A-10 Durakool Switch. These two switches are also identical in dimensions.

Electrical Conduit Fittings (1224)

A combination of electrical conduit fittings that can be handled in the same manner as a mitred stove-pipe elbow was recently announced by Johns-Manville. A box of these fittings with a shipment of Transite asbestos-cement ducts prepares the contractor for practically any change in direction with a minimum of lost time and materials, according to the company. Consisting of curved segments, deflection couplings and sweeps, the fittings facilitate the by-passing of obstructions not anticipated in the design period and overcome the expense and delay of special fittings.

Adjusto Washers (1225)

A new "adjusto" washer for mounting all types of switches and receptacles using regular screws has been developed by Amco Mfg. Co. These washers are a real engineered device that holds the switch or receptacle



in a straight or rigid position, and due to their construction keep the screw locked all the way down.

Miralume (1226)

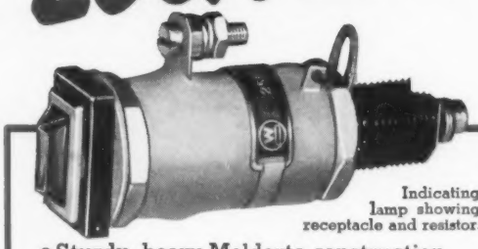
Miralume F-230, a complete fluorescent lighting unit, has been designed by Hygrade to incorporate the new 100-watt Hygrade fluorescent lamps. This larger fixture comes complete with two 100-watt white fluorescent lamps, each 5 ft. long. Development of this new unit meets the demand for a more powerful light source for industrial applications where higher total lumens are required from each fixture. It comes completely wired and ready to use; is corrected for stroboscopic effect, and comes complete with lamps, starters, and Hygrade's Dua-Lamp auxiliary.

Brigadier Improvement (1227)

An improvement in design and consequent lowering in price of its Brigadier unit has been made by The Wakefield Brass Co. This unit was originally announced last December, and has a large canopy containing the ballasts replaced with a typical 6 in. canopy of the usual standard fixture design.

Flush-mounted indicating lamp . . . visible from all directions.

Look at it from any angle



Indicating lamp showing receptacle and resistor.

- Sturdy, heavy Moldarta construction.
- Compact . . . projects only 4 inches behind panel
- Accessible . . . easy to install and wire . . . terminals face rear
- High visibility, yet low drain—4 watts instead of 14
- Substantial terminals—10-32 screws
- Universal mounting . . . fits $\frac{1}{16}$ to 2-inch thick panels

INVESTIGATE OTHER NEW WESTINGHOUSE DEVICES

"STREAMLINED" INSTRUMENT AND CONTROL SWITCHES
MULTIPLE-LINE HIGH-PRESSURE CONTACT DISCONNECTS
HIGH-STRENGTH COMPACT TERMINAL BLOCKS
BORIC ACID CURRENT LIMITING AND "DE-ION" FUSES
BUS SUPPORTS • UNIVERSAL PIPE FITTINGS
WIRING DETAILS, PANEL BRACKETS AND ACCESSORIES

. . . DETAILS *ARE* IMPORTANT . . . ESPECIALLY IN SWITCHGEAR!

Indicating lamps are just one of many items contributing to efficient operation in modern switchgear. Painstaking engineering attention to these details, however, can make major differences in over-all performance.

Take, for example, this new Westinghouse wide-angle lamp indicator. Flush-mounted, in keeping with the modern trend in instruments and relays, its lens design enables it to be seen instantly and easily from any angle. Its new low-drain bulb takes only 4 watts instead of 14. Depth of mounting space required is only 4 inches.

Similar outstanding advantages in other switchgear details, made possible by meticulous engineering care, are important reasons for specifying Westinghouse switchgear. Before you invest, investigate Westinghouse switchgear. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

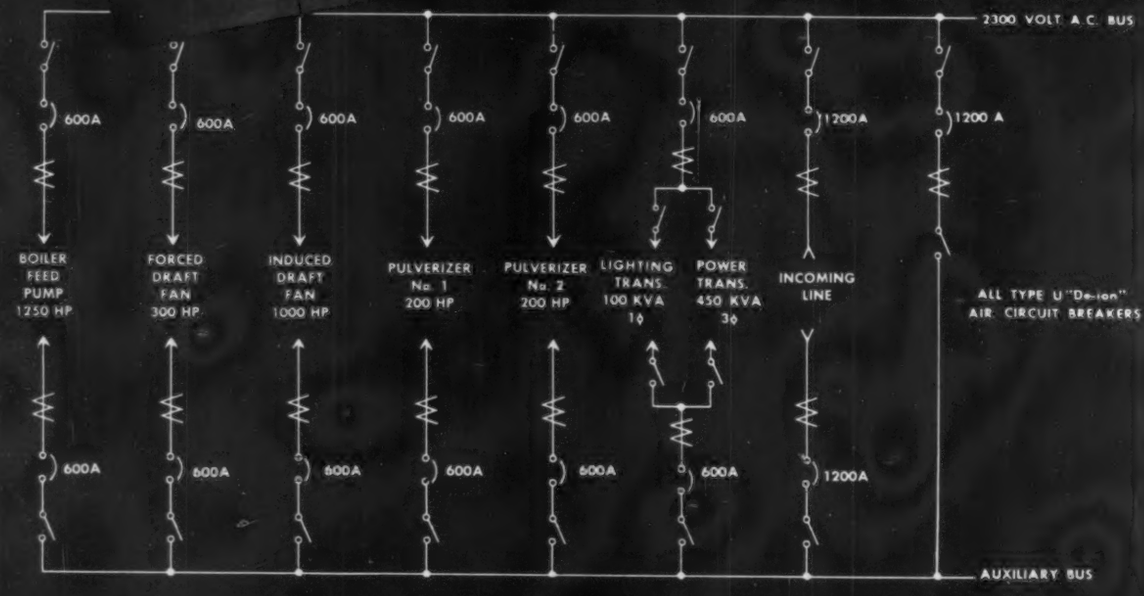
J-60419

Westinghouse

SWITCHGEAR DEVICES

WESTINGHOUSE ELECTRIC

RELATED PROTECTION . . . FROM

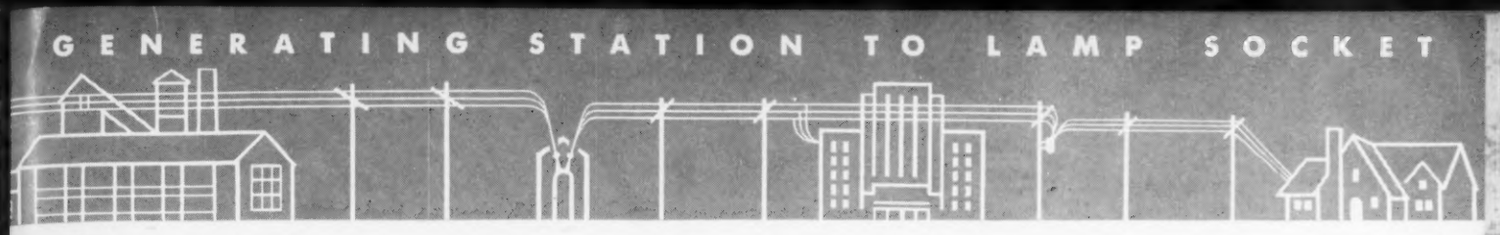


AIR SWITCHGEAR FOR EASTERN UTILITY

These 15 compact metal-enclosed units house air breakers controlling powerhouse auxiliaries for a prominent eastern utility. Westinghouse Type U "De-ion" Air Breakers are used throughout. Operator is shown manually closing 2300-volt breaker. Circuits controlled are shown at left.

Westinghouse indoor metal-enclosed air switchgear is built in capacities up to 34.5 kv and 1,500,000 kv-a or 15 kv and 2,500,000 kv-a interrupting capacity.

Westinghouse *Metal-enclosed*



THREE BEST ANSWERS TO MODERN SWITCHGEAR NEEDS

AIR breakers METAL enclosed by WESTINGHOUSE

Air breakers simplify circuit protection . . . eliminate fire hazards and maintenance . . . reduce space requirements . . . facilitate inspection. *Metal-enclosed switchgear* enables fullest use of *all* of these advantages.

Both power air breakers and metal-enclosed air breaker switchgear owe their origin and broadest development to Westinghouse. Since Westinghouse installed the first power air circuit breaker in 1927, more than 1,000 have been placed in service by Westinghouse. And back of the hundreds of Westinghouse metal-enclosed switchgear installations, are more than THIRTEEN YEARS experience in building metal-clad air circuit breaker switchgear.

This double backlog of operating experience can provide a practical, *proved* answer to any switchgear problem. Take advantage of it—install Westinghouse metal-enclosed air circuit breaker switchgear. Ask for literature. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

METAL-CLAD AIR BREAKER SWITCHGEAR

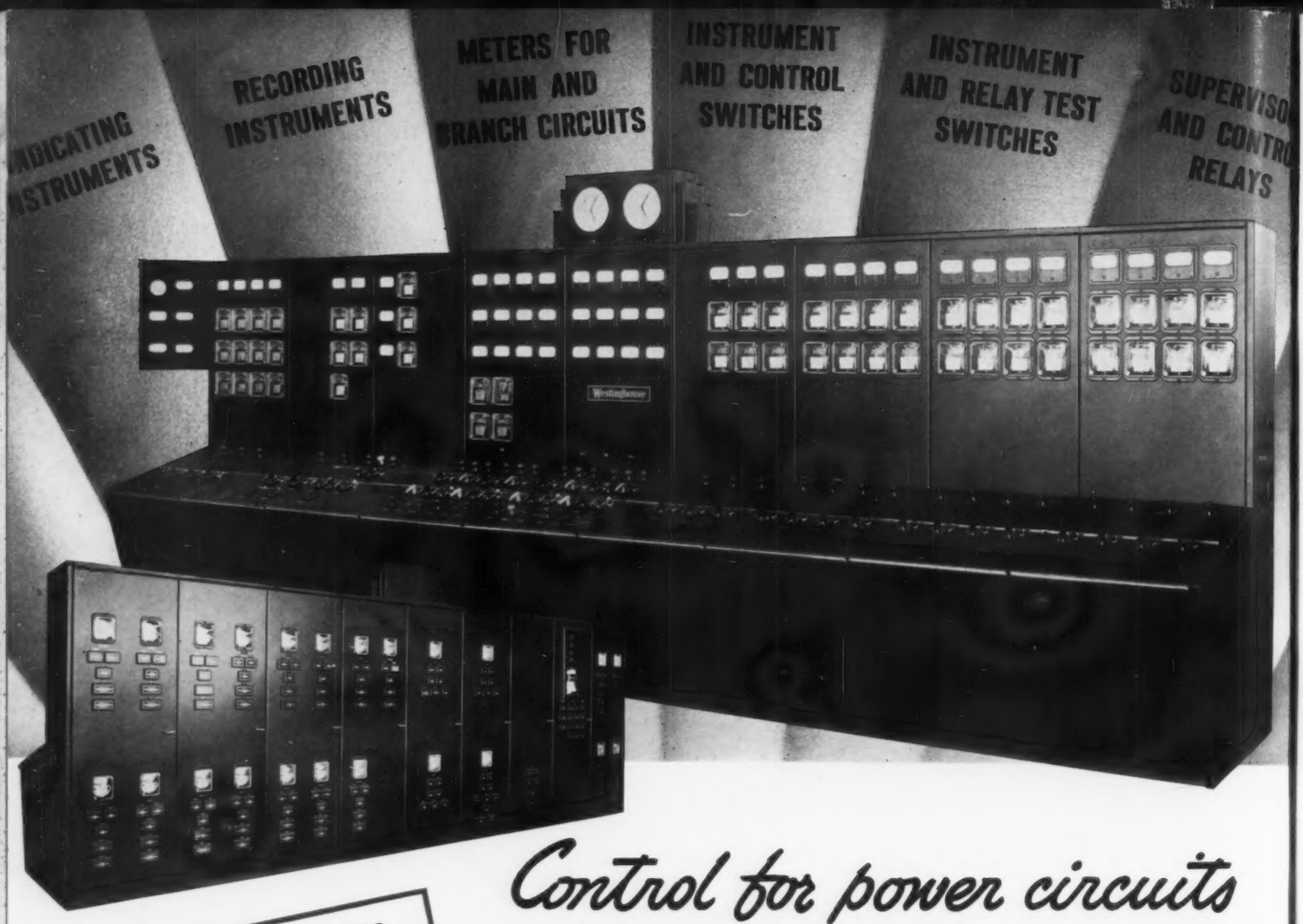
Despite small size of enclosure, adequate room is available inside cells for easy cleaning and maintenance when breaker is drawn out. Interchangeable units prevent lengthy shutdowns. Safety interlocks and barriers protect against operating errors. Shipped complete.

LOW-VOLTAGE METAL-ENCLOSED AIR BREAKER SWITCHGEAR

Draw-out type breakers can be isolated for inspection or test with safety to the operator. Factory assembled, factory tested, and shipped ready to set in place. For duty to 600 volts, breakers are rated to 6000 rms amperes a-c with interrupting capacities to 80,000 rms amperes.

Air Circuit Breaker Switchgear

W WESTINGHOUSE ELECTRIC



Control for power circuits IN ONE PACKAGE

... EASY TO INSTALL ... EASY TO USE ... EASY TO EXPAND

WESTINGHOUSE CONTROL DESKS

Centralized control for efficient operation of large power stations

•

Sectional design—add future units as desired

•

Duplex panels front and rear

•

Factory assembled—shipped complete

•

Saves space—saves wiring—saves installation costs

A NEW "SLANT" ON CONTROL HANDLES

New, colored Moldarta streamlined control switch handles reduce fatigue, make handling easier and surer through new "comfort angle" and shape. Varied colors available aid circuit identification.

How can control facilities—whether for generating station or distribution or switching substations—be made simpler and more compact?

Westinghouse Control Desks provide the answer—in types to meet any combination of operating and installation conditions. Modern desks like the above combine both control sections and instrument panels in one factory-assembled unit—with the space-saving duplex panel arrangement in rear for recording meters and relays. Other Westinghouse types provide separate desk and panel construction. Still others offer additional flexibility by circular form or through use of miniature controls and instruments.

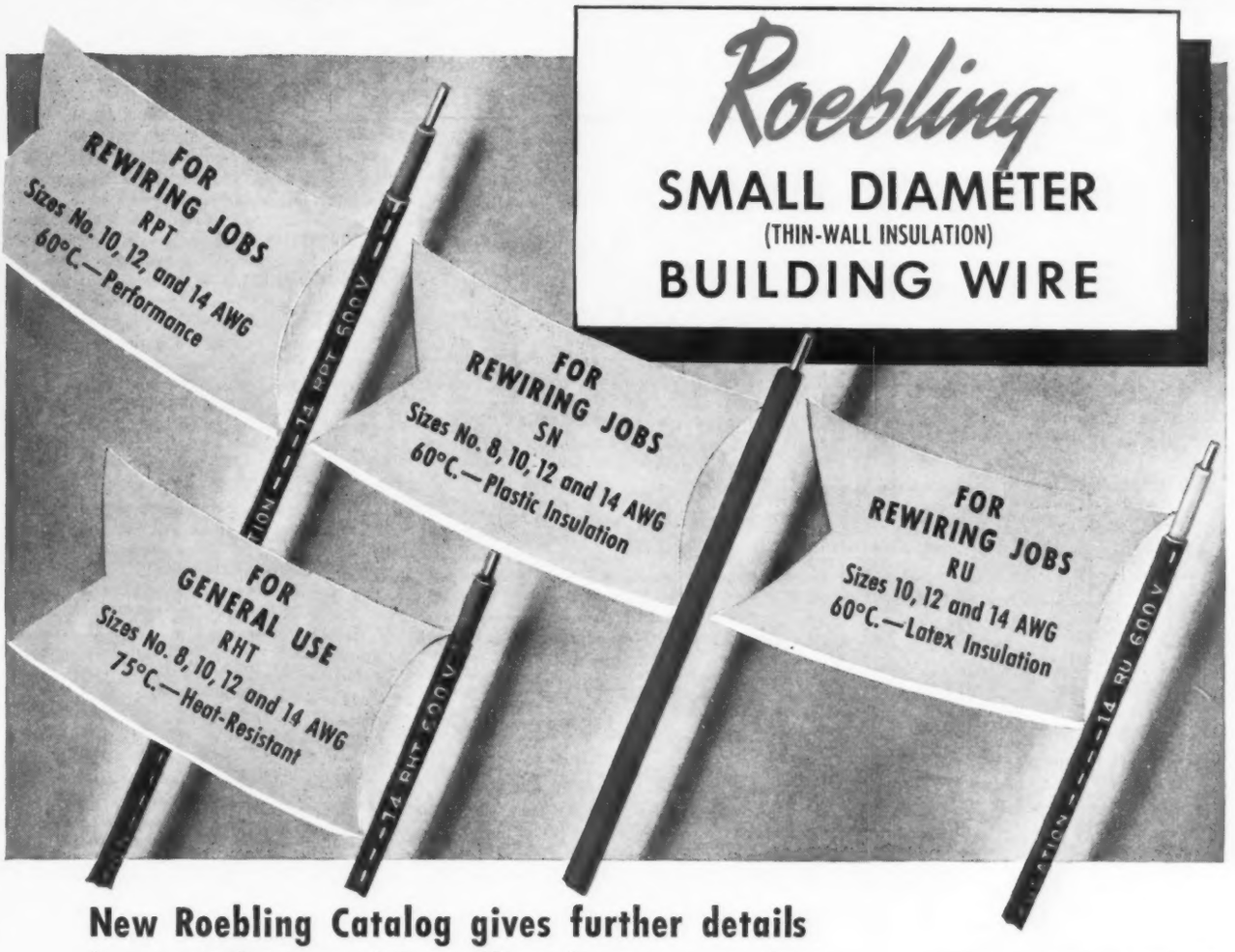
By putting control problems up to Westinghouse you can insure *related control* for related protective equipment and save installation costs and headaches. Ask your Westinghouse representative or write for literature. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

WESTINGHOUSE ELECTRIC

Westinghouse

CONTROL DESKS

4 CHOICES



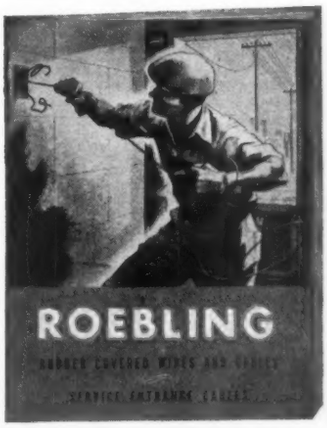
New Roebling Catalog gives further details for specifying and installing larger capacity feeders—adequate branch circuits

"Thin-Wall" broke the bottleneck of inadequate wiring—by making more wattage available through existing conduit. But the Underwriters Standards for this new Building Wire are detailed and complex...and you must know your Code before any particular wire can be specified.

Although all these wires have a maximum operating voltage of 600 volts, the basic characteristics vary with the insulation. With the exception of SN, these wires have a fibrous covering that is moisture-resistant and flame-retardant.

And there are many more factors—such as Number and Size of Conductors in a Conduit, Current-carrying Capacities under various installation conditions—that must be determined before work can proceed. That is where the Roebling Catalog, shown, can help you. If you haven't received your copy, be sure to write for it now.

JOHN A. ROEBLING'S SONS CO. OF CALIF.
San Francisco Los Angeles Seattle Portland



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Catalog No. 103

ROEBLING SMALL DIAMETER BUILDING WIRE

The MOST COMPLETE LINE OF *Terminal Lugs*

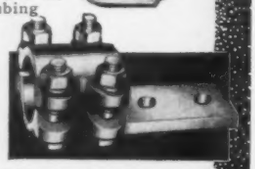
THOUSANDS of patterns — you can find the exact lug you want.

Penn-Union E-Z Lugs take a wide range of conductor sizes. Only 5 sizes of lugs for wire and cable from No. 6 to 1,000,000 CM. Self-locking; positive. Re-used over and over.

QUICK, SIMPLE INSTALLATION with the popular Penn - Union VI-TITE lug. Vise-like action gives a sure grip. Made in a wide range of sizes.

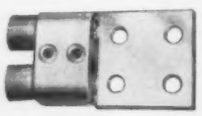
Fully approved *Soldering Lugs*, pressed from pure seamless copper tubing, and annealed. Also cast Heavy-Duty Soldering Terminals—and shrink fit lugs for copper tubing.

CLAMP TYPE terminals in widest variety. Straight or angle, for cable or tubing, with any desired contact tongue.



SCREW TYPE Solderless, easy to use and universally popular, especially in the small sizes. For both solid and stranded wires.

MULTIPLE CABLE terminals. We can furnish any style lug for two or more conductors.



SLEEVE TYPE terminals, with split contact sleeves, preferred by many large users. Made in many types.

See the Penn-Union Catalog for any kind of Terminal Lug — carefully made, thoroughly tested, *Dependable.*

Also the most complete line of Cable Taps, Service Connectors, Ground Clamps, Two-Ways, Tees, etc.

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1063 HOWARD STREET
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NORTHWESTERN AGENCIES
2411 FIRST AVE.,
SEATTLE, WASHINGTON
PENN-UNION ELECTRIC CORP., Erie, Pa.

PENN-UNION
Conductor Fittings

PRODUCT DATA

Demand Meters (1228)

A 14-page illustrated booklet containing information on the widely used type "R" kilowatt hour demand meters, designed for use in industrial, central station, and other plants where continuous records of electrical demand are essential, has just been issued by Westinghouse. A continuous series of large size pictures, all completely labeled, gives the reader a birds-eye view of the construction, and the operation of the type "R" meters. Accompanying the illustrations are well-written explanations of meter reading, and operation. Samples of several different kinds of charts for various types of readings are shown.

Insulation Tester (1229)

How to Test Insulation and avoid trouble in electrical equipment" is an "ABC of Megger Testing" that is available through the James G. Biddle Co. Good and bad insulation, insulation resistance, is discussed and the characteristics of "Megger" instruments included.

Carbon Dioxide Use (1230)

"In Case of Fire," is an 8-page, two-color booklet recently issued by the C-O-Two Fire Equipment Co. It describes the uses of carbon dioxide for fire extinguishment, shows complete line of hand and wheeled type extinguishers, hose systems, recharging equipment, sales and service points.

Graphic Instruments (1231)

Some Causes of High Cost and how to overcome them is the theme of bulletin No. 335 of "The Graphic", published by the Esterline-Angus Co. The importance of graphic instruments in lowering industrial plant costs is emphasized in this issue. Various concrete examples of reductions due to these units are given.

Handling Loads (1232)

In "Seven Steps in Handling Industrial Loads," seven typical steps common to most industries, each a spot where waste may occur in materials handling, are described in a 12-page illustrated bulletin issued by Elwell-Parker Electric Co. With continuity, says the bulletin, large cash savings in the cost of handling loads through production are simply the total of such savings in each department. The author advocates abolishment of the "teaspoon method" of materials handling, and the elimination of clogged plant aisles through keeping material on the move.

Fluorescent Design (1233)

A new manual, "How to Design Fluorescent Lighting," has just been published by the Westinghouse Lamp Division. Correct mountings and structural details are given in expanded form to help suggest spacings of units for maximum benefits and efficiency. The importance of room factor, including room proportions, reflection factors, and lighting equipment to be used, are fully explained. Various levels of illumination are tabulated to make the selection of the proper number of lamps simple and easy. Examples and design sketches, as well as a list of general lighting precautions, with remedies and suggestions, and two pages of cost analyses, also are included.

Time Switches (1234)

"G-E Instruments and Time Switches" are the subject of a new General Electric bulletin which shows how these units may be used to increase plant efficiency. Recording instruments, time switches, volt ammeters are thoroughly described. Illustrations of each instrument are used.

Capacitors (1235)

A two-page data-sheet on high voltage inerteen-filled capacitors, for direct current service, has just been announced by Westinghouse. Designed especially for filter applications in transmitters, resonant shunts, etc., units are available for operation on voltages from 600 to 100,000, and in capacitance ranges from .01 microfarad to 50 microfarads; the higher microfarad ratings being in the lower voltage ratings. Numerous applications are listed and use of capacitors in each explained. Distinctive features are outlined and a general description of the capacitor construction is contained. Back of the sheet gives electrical ratings and dimensions in a convenient table.

Automatic Switches (1236)

Automatic switches are discussed in a new booklet just published by the Reliance Automatic Lighting Co. These synchronous time switches are compact, with a slow-speed heavy-duty motor, two-circuit control, and are housed in a 20-gauge sheet steel finished case. Furnished in several types, these units are fully presented both by illustration and complete data.

Electrostatic Volt Meter (1237)

A four-page bulletin on an electrostatic voltmeter has been issued by General Electric. Every phase of this instrument is outlined, diagrams are given and a cross-section photo of the instrument is included. Examples of typical uses conclude the publication.

Transmission Line Fittings (1238)

An 8 page bulletin listing and describing various types and shapes of transmission line fittings suitable for use on all classes of service for copper, ACSR, and composite conductors has just been issued by Westinghouse. Listed and described are strain clamps, distribution clamps, suspension clamps, yoke assemblies, hooks, clevis, and other miscellaneous fittings for use on all types of transmission lines, for supporting either main conductors, guy, or ground wires.

Panel Instruments (1239)

A 12-page illustrated catalog covering the "35" line of miniature panel instruments of the three-inch classification is presented by Westinghouse Electric & Mfg. Co. These small instruments, approximately 3 in. in diameter, and available in round or rectangular styles have a broad field of application; from industrial and radio test apparatus down to the gadget of the amateur experimenter. A list of 12 suggested applications plus sections giving descriptions of construction, distinctive features, and operating principles make up the first part of the booklet. Illustrations are used throughout to amplify the written descriptions. Dimension and mounting data are given.

NEW BOOKS

"PHOTO RELAYS, Their Theory and Application," by F. H. Shepard, Jr., consulting engineer, published by the Allied Control Co. New York, price 25c. This book covers photoelectric phenomena, amplifiers, glow discharge tubes, light sources, applications and is filled with numerous illustrations and diagrams. The author was formerly in charge of the special electronics division of RCA and has collaborated in the publication of several books and articles on this particular subject.

"TORCH OF CIVILIZATION", by Matthew Luckiesh, D.SC., D.E., director of General Electric's Lighting Research Laboratory at Nela Park, Cleveland, Ohio. Published by G. P. Putnam's Sons, New York City, $3. This 296-page book, apparently the author's answer to modern black-out's sinister mocking of civilization, is indeed timely. Although it is so written as to hold the interest of the average high school student, "Torch of Civilization" contains much to capture the imagination of the average adult. In this the twenty-first book (relating to light, sight, color, health, etc.) written by Luckiesh, the author rises to his fullest stature as a writer-scientist. Viewing light this time in its broadest sense, Luckiesh takes the reader on many a sally into such realms as mythology, religion, philosophy, history, physiology and biology.

"SUPPLEMENT TO ELECTRIC POWER STATISTICS —1939" reports in detail, the production of electric energy, capacity by types of prime mover, and fuel consumption for all classes of ownership by States and geographic divisions for the previous calendar year. The new publication, which contains the basic tables from which data are derived for the Commission's annual summary on power capacity, production and fuel consumption, has been issued for the first time to meet the many requests for detailed information from members of Congress, Federal agencies, chambers of commerce, State planning boards, and students of the industry. Price, 25c.

ILLUMINATION ENGINEERING, by Eugene W. Schilling, Professor of electrical engineering, Montana State College, published by International Text Book Co., $—. Designed for the student who does not wish to specialize in illumination but intended to give sufficient training in the fundamentals to enable those who expect to be utility men, architects, or city managers to understand the subject and lay out simple lighting systems, this text has been built for a course meeting three times a week for a term. It is so arranged, however, that laboratory work may be started immediately.

"TEST SPECIFICATIONS FOR HOUSEHOLD ELECTRIC RANGES" is a bulletin developed by a joint committee composed of representatives of the Edison Electric Institute and the National Electrical Manufacturers Assn. Adopted by the latter organization, these tests were undertaken to eliminate confusion as to proper tests for electric cookery, and to set up a standard test methods.

"EXPERIMENTING WITH LIGHT", containing practical problems for students in science, has just come off the presses and is now available, according to the Illuminating Engineering Society under whose direction the book was prepared. Designed for use in high school physics courses, the manual outlines a dozen practical experiments with light which which may be worked out by the student with simple, low-cost material, locally obtainable or easily built. The book attempts to give a better concept of the fundamentals of light already studied and a knowledge of the practical problems of lighting as an aid to seeing in everyday life. It may be obtained from the Illuminating Engineering Society, 51 Madison Ave., New York City, at a cost of 25 cents per copy.

The NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION has published an analysis of the 1940 Revision of the National Electrical Code. Copy is available in pamphlet form approximately the same size as the Code. This analysis describes all changes from the 1937 Edition, and in many cases, enables the reader to see at a glance the effect of the change. In some cases, the reason for the change made by the Electrical Committee is cited. Copies may be obtained from the National Electrical Manufacturers Assn., 155 East 44th Street, New York, N. Y., at the following rates postpaid: First 9 copies 25 cents each; next 1 copies 17 cents each; next 75 copies 13½ cents each; all over 99 copies 10 cents each.

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To keep posted, simply circle the items in which you are interested, cut out the coupon (it can be pasted on the back of a postcard) and mail to:

ELECTRICAL WEST, 68 Post St., San Francisco, California
Please send me the following CIRCLED items:

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Name ..... Title* .....

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Address

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

WANTED

Denver Representative

Manufacturer of a well known line of automatic time switches is seeking an aggressive Manufacturer's Representative with headquarters in Denver, Colo., who is well established with the electrical wholesale and sign supply jobbers.

Reply to Box 401
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G.C.A.
Lamp Replacers
Lamp Base Removers
Cartridge Fuse Tongs
Switch Hooks
Send for Catalogue
We have been making safety tools for 24 years
THE G. C. A. Manufacturing Co.
Pittsfield, Mass.

TORK CLOCKS

THE POPULAR TIME SWITCH LINE KNOWN EVERYWHERE

NOW—lower prices and higher capacities

There is a Tork Clock for every regular switching job; 60 minute, 4 hour or daily cycles.

Bulletins on request

THE TORK CLOCK CO., Inc.
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H. M. Sayers, 1019 Eastlake Ave., Seattle
Stevens Sales Co., 41 P. O. Place, Salt Lake City

SCANNING THE MAGAZINES

Relay Selection

"Rack Coordinates Relay Selectivity," *Electrical World*, Oct. 5, p. 54. To simplify selectivity and coordination study, Westchester Lighting Co. has worked out a rack, employing a single cycle-to-close scale and as many strips of fault-current scales as there are relays involved. The article is abstracted from an EEI paper.

Fluorescence

"Magazine of Light" published monthly by General Electric carries in its October issue the story of the trend to fluorescent lighting. Many industrial and business store installations are discussed and illustrations given.

Testing Pot Transformers

"Potential Transformers Tested in Service" —*Electrical World*, Nov. 16, p. 48—This gives details of a method used by Philadedphia Electric Co. The method is described as having the advantages of economy, using actual burdens, minimizing transformer stock and checking local factors affecting meter performance. The test does not interrupt service to the customer.

Adequate Wiring

"And They Lived Happily Ever After," by Kathleen Robertson, *McCall's*, January, 1941. A story on adequate wiring written in collaboration with H. M. Walne, home service director, Dallas, (Tex.) Light & Power Co.

Luminaires

"The Design of Luminaires for Fluorescent Lamps," by W. M. Potter and W. G. Darley, *Illuminating Engineering*, November, p. 759. A paper presented at the 34th Annual IES convention held at Spring Lake in September. Authors of this splendid presentation are connected with the Nela Park Engineering Dept., General Electric.

Contractor Service

"What Have We Got to Sell?" by Ray W. Ashley, *Electrical Contracting*, November, p. 17. The author discusses what a well organized and properly equipped contractor has to sell, and and offers some pointers on what and how he should sell. This papeer was presented at the Florida convention.

Convention

"38th Annual NECA Convention," *Qualified Contractor*, November, p. 9.—a complete review of the gathering down in Jacksonville, Fla. this year.

Retailing Costs

"The Control of Expense," by Ernest C. Hastings, *Electrical Merchandising*, November, p. 19.—This is the second article in a series on the cost of retailing appliances. Revealing charts show percentage expenses for six operating divisions of loss and profit stores.

PELTON *engineering and* CARBONDALE

refrigeration products are effectively combined to service the needs of western industry... offering these unusual advantages for detail planning, manufacture and assembly of equipment, and installation. The experience and facilities of these two nationally recognized organizations is immediately available, whether your refrigeration project is large or small, simple or highly involved.

Stocks Maintained in Our San Francisco Plant
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Western Representatives for the Carbondale Division of the Worthington Pump & Machinery Corporation.

THE BALDWIN GROUP
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LETTERS

Since 1898

SIRS:

If available, I would like a photographic print from which the front cover of ELECTRICAL WEST for May, 1940, was reproduced. I assume that the complete photograph is somewhat larger in scope than the portion shown on your cover. . . .

It may be of interest to you to know that I have read your publication under one name or another ever since 1898, when, as I recall, it was published as "Journal of Electricity."

A. J. NOERAGER,
Chief Electrical Engineer
Braden Copper Co.
Rancagua, Chile.

Wiring Coverage

DEAR SIRS:

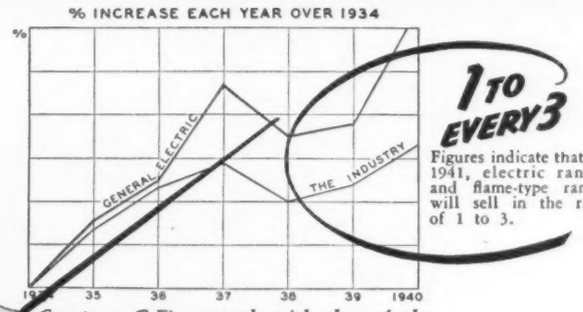
I have intended writing you for some time to let you know that I think your publication is the best of a number that I receive. I like the way you cover the wiring problems of our industry. Either the wiring activity plays a greater part in the West, or you give it due credit more than do editors of other publications.

Please keep up the good work as I get a great deal of inspiration from reading the reports and articles each month.

CHAS. V. DUNN
Technical Advisor
Wiring Promotion
Kansas City Power & Light Co.

GENERAL ELECTRIC TURNS ON THE HEAT

With Greatest Electric Range Promotion Ever Created for Dealers!



1 TO EVERY 3

Figures indicate that, in 1941, electric ranges and flame-type ranges will sell in the ratio of 1 to 3.

Compare G-E's growth with that of the whole industry! Total sales of electric ranges increased from 50,000 in 1933 to 448,000 in 1940 (est.). An amazing growth! Yet this rate of increase has been exceeded by that of General Electric Ranges!

The Trend Is to Electric Cooking! And 1941 Will Smash the All-Time Record of 1940!

SWING UP WITH GENERAL ELECTRIC RANGES

Alive with New Features for 1941!

Swing up to higher profits with this range that's racing ahead! Cash in on these salable features! The new "Flavor-Saver" Oven. The new, faster Thrift Cooker. The Calrod "charcoalike" broiler. The No-Stain Vent to help keep kitchens clean. And a raft of other advancements for clean, cool, fast, low-cost electric cooking.

Cash in on the powerful G-E promotion for 1941! Bigger, smarter, more intensified than ever! Smashing *color advertising in national magazines.* More compelling *mailing pieces.* More arresting *displays.* More attractive *newspaper ads* for you to run locally. All crammed with "sell."

Get set—pretty—with General Electric Ranges for 1941. Join the trend. See your G-E distributor now.

General Electric Co., Bridgeport, Conn.

Every Roast Will Work for You in 1941!

Watch for the big G-E announcement that will make all America "roast-minded" — and "General Electric Range-minded"! . . . Soon!

GENERAL ELECTRIC RANGES

NO SUPERLATIVES . . . JUST MEAT

The Chinese had an old proverb, "A picture is worth a thousand words." So we took a tip from the old saw and put it into our 1941 catalog on Hi-Line Hardware.

No superlatives, no long winded adjectives, just a reference book of good old blue prints with the vital information in an easy way to catch at a glance.

For the man who wants to pick up a catalog he can get his teeth into without wading through pages of type—this is it.

B.T.C. goes to press and the 1941 edition will be ready shortly. Please write us now so we can make sure that you receive your copy.

THE BREWER-TITCHENER CORPORATION . . . . . CORTLAND, NEW YORK

MORE THAN A FORGING . . . A *SERVICE*

HEADQUARTERS for LIGHTING

AT THE SIGN READING . . .
Westinghouse

NOW . . . when time is at a premium . . . 117 local Distributors offer individualized engineering counsel and complete lighting equipment stocks.

WESTINGHOUSE SUPPLIES THE ANSWER

Providing highly specialized engineering services, improved products and a wealth of lighting experience, Westinghouse is daily helping hundreds of American Industries to speed up production . . . protect plants and property . . . insure better products.

Why not shift this burden of individualized engineering counsel to Westinghouse? This service is always available to you . . . to help you prepare sound lighting recommendations . . . quickly and with the least amount of effort.

Westinghouse offers interior lighting equipment and floodlighting for every commercial and industrial need. These highly-flexible lines include quality-proved fluorescent . . . incandescent . . . and high intensity mercury fixtures. Whatever your customers' lighting requirements may be, there is a Westinghouse product and a Westinghouse plan to improve factory and office illumination.

Start saving valuable time for you and your customers today . . . consult your nearest Westinghouse Lighting Distributor, or write for "Descriptive Data Kit"—Department H, Lighting Division, Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio.

TUNE IN "MUSICAL AMERICANA," N. B. C. RED NETWORK, COAST-TO-COAST, EVERY THURSDAY EVENING.

Westinghouse Lighting Equipment

ELECTRA'S HUSBAND

Working For Washington

"HAVING trouble with your Christmas list?" Electra asked as I crumpled a sheet of paper torn from the tablet balanced on my knee. "If you are, I can tell you exactly what your nieces and nephews want. Also I can tell you what not to send Aunt Emily. She hasn't recovered from the shock of receiving that whiskey last year. And she never will believe that alibi about your secretary getting the labels on the packages mixed."

"My Christmas list is finished and Aunt Emily, bless her white-ribboned soul, isn't down for whiskey," I replied just a little brusquely.

"Then don't tell me that you are still worrying about the election," she countered. "I thought we were through with that."

"I'm not worrying and we are through, temporarily, with elections," I said. "I was just thinking about working for the government."

"Not you," she chided. "You're too old for the draft and you're set in your present job."

"Maybe so, but before another four years pass there are likely to be a lot of people now engaged in private enterprises in the electrical business working for the government," I mused. "Some form of government, I mean. It won't necessarily be the federal government, but it may be a city or a county or a district. But it will be the government just the same. I wonder if they know what it will be like—having a civil service rating, perhaps. Or otherwise being at the mercy of whatever group or faction that happens to be in office.

"You and I know a lot of people working for government. Some of them are earnest, ambitious and filled with initiative. But they are the exception. Most of them think of three things—paycheck, timeclock and pension. Just a little casual observation around some government offices will prove that . . ."

"You forget something," Electra interjected. "They don't have to pay income tax."

"Didn't have to pay, my dear," I corrected. "But that wouldn't be enough to influence the people who may be working for government one way or another. I wish I knew what it was that seemingly makes a government job so attractive to some people and so deadening for others. Some people say its the security in the first case and the routine in the second. Certainly I wouldn't want to be taken over into a government job.

"I was talking about it not long ago with some of the fellows I know in a government-owned utility. They are civil service employees. And they haven't any security. In one shakeup caused when a new administration took over, one chap only succeeded in staying because he had an alternative civil service rating. His first job was wiped out, but his other rating in the operating department saved him from being on the street. He said there were other fellows in the same situation. One of the things they do is to take just as many of the civil service examinations that come along as they can. In most cases they aren't qualified, but they take the examinations just for the experience.

"Promotion isn't entirely on merit or experience either. Most of the time it's on examination. They are held even for managerial jobs. I'm not criticizing civil service, understand. Under the circumstances it's the best possible system to employ. I'm just saying that after all my experience in private business I wouldn't like it. The business of being known by a rating and a number sounds too much like the system used on the bad boys in the big houses."

"But it takes the jobs out of politics," Electra interrupted.

"Theoretically, yes," I continued. "But that isn't always the case. The history of politics is filled with instances where corrupt civil service boards have conducted phoney examinations, prepared fake lists and sold jobs to the highest bidders. Or they have played political favorites in assigning ratings or numbers. But here again, this doesn't apply to the majority. I cite it only to show that such things can happen."

"What started you on this line of reasoning anyway?" Electra asked.

"Well," I answered, "it's just that a lot of fine people in the electric utility business may find themselves working for government within the next few years. I feel sorry for them, for I don't believe that many of them appreciate what they are in for. Maybe they don't care. I certainly would."

UNPOPULAR among farmers, educators and electrical people in the Pacific Coast region will be a little paper-covered book, "Rural America Lights Up" by Harry Slattery, administrator of the REA (National Home Library Foundation, Washington, D. C., 25c). In building up a case for REA, the book pretty generally damns all efforts toward rural electrification except those of the government.

In the generalized assertions with which the book is filled, it is unfortunate that no references are made to exclude Utah, California, Washington, Oregon, and Idaho, where rural electrification was a practical reality long before REA was conceived. However, failure to recognize or report the eminently successful rural electrification progress in these states (except to say inaccurately that the Los Angeles municipal system was taking service to rural customers in 1923), is not the sole basis for viewing the book critically.

For instance where six pages are devoted to outlining the social significance of the REA, some twenty-seven pages vilify the power companies for asserted hostility. Mr. Slattery says:

"The opposition of the power companies has proven a serious obstacle in the past; it exists at the present time; and, although there have been moments when we have hopefully believed it was disappearing, there is every reason to believe it will continue . . .

Then follows twenty pages of condemnation.

Electra and I both agree that it would have been better if this entire chapter of the book had been omitted. She, particularly, is a firm believer in the immediate and pressing necessity for national unity. There can't be any national unity if men in high government places continue to revile and upbraid business and industry. The breach between the two simply becomes more irreconcilable. "Rural America Lights Up" won't help promote unity.

"Maybe it wasn't supposed to," Electra says.

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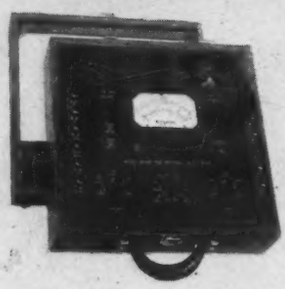

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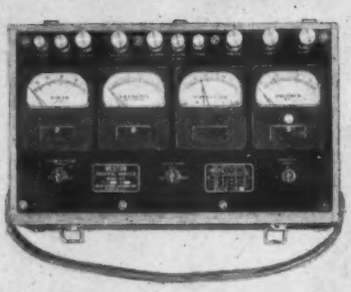

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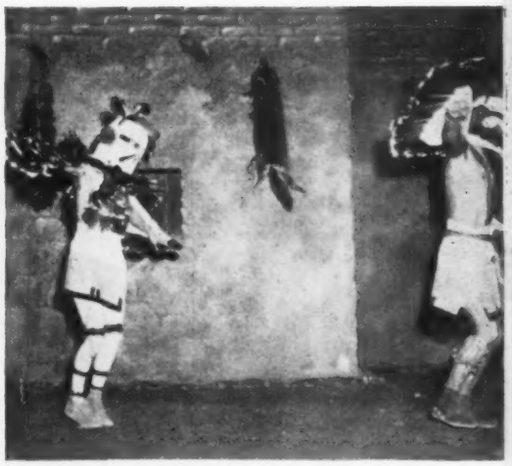


Ancient Indian Rituals Go Fluorescent

By George A. Hill*

THE SMOKI PEOPLE of Prescott, Arizona, comprise a group of over 300 white men and women who have consecrated themselves to the cause of perpetuating the ancient, legendary dances, chants and folklore of the Indians of the Southwest. It all started two decades ago, with an impromptu burlesque of Indian dances, which so impressed the participants with the real significance of these rites that they banded together for the purpose of seriously studying and dramatizing them for the inspiration of the white man. From this beginning grew The Smoki People who, in their Ceremonials presented only once each year, re-enact, after months of arduous study and preparation, the symbolic rites of an ancient people which might otherwise be forever lost to the world.

For the twentieth consecutive year, the Smoki dance!

It is sundown, August 4, 1940. Some four thousand spectators have assembled from far and near to witness this most unusual of entertainments—the Smoki Ceremonials. The scene is the ancient Hopi village of Sichumovi, in front of which is a large ceremonial plaza perhaps 300 ft. wide and 200 ft. deep. Indians—squaws and children—pursue their duties around the communal adobe pueblo in the background and a few goats and donkeys graze listlessly along the fringe of evergreens at the sides of the plaza.

The Hopi are preparing for a visit from the Zuni. Three members of the tribe are completing an elaborate colored sand-painting, about 20 ft. in diameter, on the ground near the center of the plaza. Squaws are gathering wood and lighting many small fires, forming a large semi-circle across the back of the plaza. An atmosphere of expectancy pervades the village.

As daylight fades, the audience is hardly aware that artificial lighting is taking its place. First, the cool blue of deepening twilight; then, as darkness descends, the warm amber of fire-light gradually spreads over the scene as if diffused from the scattered camp-fires, rather than from floodlights overhead.

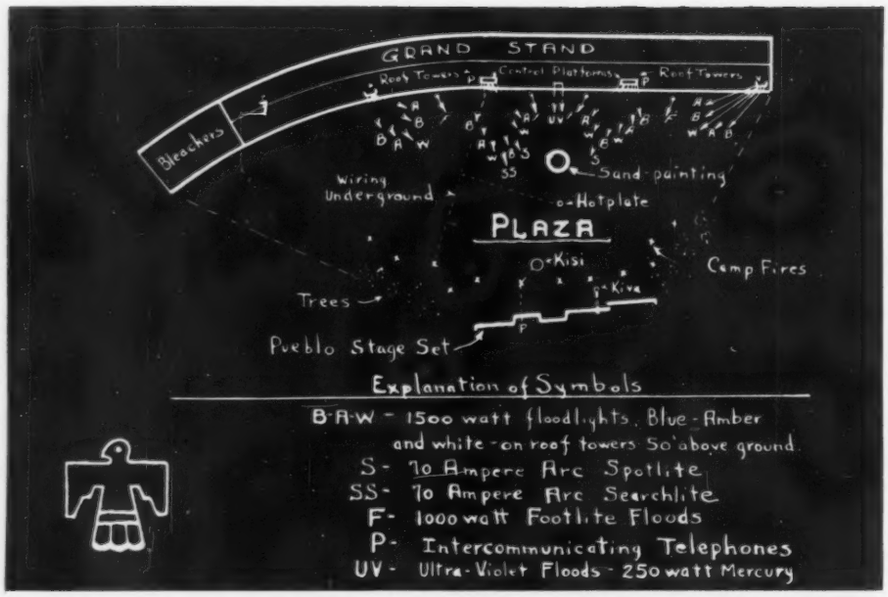
The slow, measured beat of a drum is heard as the Zuni approach the village, and Pautiwa, the Sun God, in grotesque costume and green mask, appears. With impressive ceremony he salutes the seven points of his mythical world and then advances to welcome the Zuni chief, who is accompanied by the Zuni Katchinas (Gods), each wearing large, elaborately decorated masks covering the entire head, and colorful, spectacular costumes, every detail having a special religious significance. As these characters appear, the general lighting is supplemented by straw-colored beams from two large arc spotlights, to highlight and follow the action.

As the two chiefs meet, the Koyemshi, a group of strange Zuni Gods wearing identical weird brown masks, take over the task of supervising and supporting the other dancers. They are aided by a drummer and chanters in conventional dress, who start the rythm for the colorful Pamurti ceremony, or Dance of the Birds. The brightly burning camp-fires seem to die down partially as the overhead amber lighting slowly gives way to a moonlight blue, supplemented by the glow from concealed straw and orange footlights.

The Birds, worshipped as trusted messengers by both tribes, are summoned by the pantomine of the Koyemshi. The humming birds, then the ducks, the eagles and the owls come forth in

Smoki ceremonial dancers are pictured above. Leader of the Snake Priests (left) signals the underworld gods the dance is about to start. Giant Shalako dancers (center) with the fluorescent masks photographed under ultra-violet radiation. The Eagle and his mate (right) imitate motions of flight in the Bird Dance

* Lighting Engineer, Arizona Power Corp., Prescott.



Lighting plan of the Smoki Ceremonials where 72-kw. of illumination make possible performance of this ancient rite at night

pairs, beautifully costumed, and in turn depict in their dances the graceful movements of their flight. Interesting colored shadows of the dancers, caused by a spotlight beam from each side in changing complementary colors, add to the beauty of ceremony. The various high Gods, to show that they are pleased with each dancer's artistry, pantomine their approval and create sand-paintings upon the ground.

As the Bird Dances reach their climax, camp-fires again flame high as the overhead amber lighting spreads over the plaza, and the two tribal chiefs are seen conferring in the foreground, telling one another of the many other beautiful ceremonies of their respective tribes. Being unable to impress each other in this manner, they endeavor to do so by performing feats of magic.

Calling to the assembled tribes to watch, the Zuni chief kneels to the ground and carefully plants a single kernel of corn beneath the soil. In pantomine, he entreats the Gods to make the corn grow; and behold, in a few moments the first tender shoot breaks the soil and continues to grow and unfold its foliage until a full grown stalk at least six feet tall stands before them.

The Indians gasp in awe at this display of magic, but the Hopi chief still shows his disdain and advances to the edge of the large sand-painting made by the three Hopi Indians just before the arrival of the Zuni. He circles the painting several times, shaking his gourd rattle vigorously over it each time—and the lighting dims very slowly to a total black-out.

As total darkness envelops the scene, the sand-painting, which previously appeared very drab in color, suddenly comes to life, and the ancient and symbolic figure of the double-eyed bird is seen in black, white-bordered against a deep blue background and enclosed in concentric circles of yellow, red and green, the colors glowing vividly in beautiful luminous shades as if from hidden fires beneath the surface of the ground. The assembled Indians stand transfixed by this wonderful sight and spectators rise in spontaneous applause, as the Hopi chief stands erect, his green mask and red torso glowing in mid-air, to survey his handiwork. The Zuni chief, most astounded of all at this amazing display of Hopi magic, tries to regain his composure by sending for his Shalako dancers to continue the ceremony.

As a small fire is lighted in the background, sending up a thin column of greenish luminous smoke in the darkness, six Shalakos come forward in single file to view the sand-painting, only their enormous horned heads being visible in a glowing green fluorescence.

As the Shalakos leave the scene of the sand-painting, the plaza is again bathed in visible light of moonlight hue, after which the amber overhead lighting is slowly brought up to full brilliancy, fully disclosing these unearthly gigantic figures for the first time. Standing over eight and one-half feet tall, each Shalako is attended by a squaw and one of the Koyemshi to help and guide his cumbersome figure through the weird rites of the dance, regarded by the Indian as one of the most impressive of all tribal dances.

The Zuni squaws, too, wish to demonstrate that they are masters of the dance. Overhead lights are again subdued to moonlight blue and amber footlights come up as three groups of squaws form in a geometric pattern and weave long ropes of colored fabric while dancing in time with the chants, then reverse the intricate steps to undo the weaving.

Smoki Snake Dance

There is an awe-inspiring stillness as the Indians on the plaza quietly withdraw to the rear and away from the snake Kisi, home of the Indians' "little brothers." The silence is suddenly broken by the shrill call of the ceremonial crier, announcing the dance. All lights, including white floods not previously used, come up, as the Thunder Priest comes forth whirling his "bull-roarer" to induce the thunder and rain. Drums start a slow beat as the Antelope Priests, their bodies and faces symbolically painted, emerge from the pueblo and solemnly circle the plaza to form in a line on either side of the Kisi.

The Snake Priests then appear from the underground Kiva and encircle the plaza, stepping forcibly on the "tromp-board" or Si-pa-pu to signal the underworld, and face the Antelope Priests while both intone a weird chant or invocation to the spirits. The actual Snake Dance, which is a prayer for rain, then begins. Single file, the Snake Priests circle the plaza and as they pass the Kisi, each receives a snake from within and holds it in his mouth just back of the snake's head. As the dancers reach the front of the plaza, the snakes are placed upon the ground and replaced by others as they again circle past the Kisi, in rhythm with the drums and chanting of the Thunderbird Clan. Snakes on the ground are picked up by gatherers and delivered to the Antelope Priests, who then join the dance, circling to the front of the plaza where both lines of priests come to a halt, facing each other, a mass of snakes entwined about their necks and arms.

The gourd rattles of the dancers speed up the cadence and the two orders of priests, joined in pairs, begin a great serpentine dance which coils and writhes around a large ring of sacred meal until the circle closes and snakes are cast within. As the priests step back in silent prayer, gatherers quickly pick up the snakes and carry them away, to be turned loose upon the distant desert that they may take the prayers of the Smoki with them back to the Gods of the Elements dwelling under the earth!

The Snake Dance is the only portion of the Smoki Ceremonials which is repeated each year. The unfailing sincerity and fidelity with which it is presented have made it a masterpiece of dramatic art, which leaves with every spectator a feeling of reverence and a greater appreciation and understanding of the Indians of the Southwest.

Lighting Methods and Data

Only three Smoki performances have been held at night. The first, many years ago, was none too satisfactory because of lack of proper lighting equipment. After these facilities had been improved, a night show was again tried in 1939, resulting in a better performance and a marked increase in attendance. The 1940 ceremonials proved successful to an even greater degree. The author was named chairman of a Smoki committee, whose one responsibility was the planning and execution of the lighting effects. This committee was confronted by many problems, among them the provision for adequately lighting a stage area larger than a football field, in at least three colors and with no wings available for the concealment of equipment. The ground plan illustrated on these pages shows the layout used for the 1940 ceremonials, with many improvements still to be made.

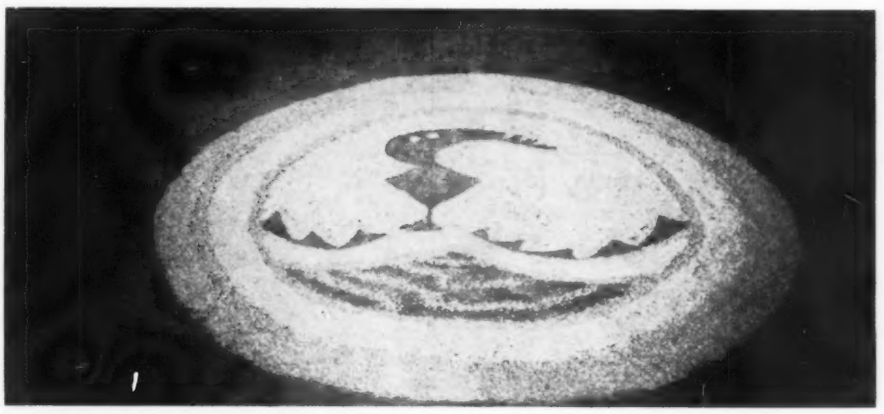
All general overhead lighting was from floodlights mounted 50 ft. above ground on four steel towers extending above the grandstand roof and spaced about 100 ft. apart. A total of 22 Alzak aluminum floodlights (Crouse-Hinds Type MUA) were used on these towers, 20 with 70-deg. beam spread and one on each center tower with 20 deg. beam. All of these floodlights were equipped with 1,500-watt PS-52 Mazda lamps operated at 10% overvoltage, adding up to about 38 kw. The total connected load for all lighting equipment was approximately 72 kw.

Energy was supplied at 2,400 volts, 60 cycles, and stepped down to 120 volts through a Type CSP distribution transformer at each tower.

Floodlights on the two end towers were directed so as to provide side lighting partially to make up for the lack of wings, and the two center banks covered the central plaza and village area. A large wooden platform was built on the roof at the base of each of the two center towers to provide space for spotlights and controls. A telephone connection was installed between platforms and to the rear of the stage to permit the co-ordination of cues and controls during the show.

Footlighting of the central plaza was accomplished by means of four olivet floods, concealed on the ground just in front of the grandstand, and equipped with 1,000-watt lamps. At the rear of the plaza, small floodlights with flame-colored lamps were concealed in shallow pits behind seven of the camp-fires, to direct additional light on the pueblo dwellings and supplement the light from the fires. Feed wires to these lights, and to a hot-plate used for igniting fluorescent smoke powder, were brought down from the roof and buried in a shallow trench. Three 70-amp. carbon arc spotlights were used to follow all important action.

Experiments disclosed that the natural white light from Mazda lamps or the arcs was too harsh for most of the effects desired, and no white light was used this year except during the Snake Dance. Certain ceremonies required a subdued moonlight effect, and a combination of moonlight blue and light green-blue gelatin color screens was found to be most satisfactory. The best color for general lighting to harmonize with the Indian atmosphere was found to be a fire-light color obtained by the blending of light straw with a medium amber.



Fluorescent sand painting depicting the symbolic double-eyed bird is 20 ft. in diameter, glows in brilliant blues, greens, reds and yellows

Black Light Effects

In working out the fluorescent effects used to simulate Indian magic, many difficult problems were encountered, and John T. Shannon of the Keese Engineering Co., Hollywood, a specialist in fluorescence, was called in to assist the Smoki with this phase of the ceremonies.

For the fluorescent sand-painting the sand or meal commonly used was found unsuitable, but after many experiments with other materials Shannon found ordinary white rice to be satisfactory, since it could be easily dyed with the fluorescent chemicals. The fluorescent dyes used were furnished by the Continental Lithograph Corp., Cleveland, as were the "Conti-Glo" fluorescent lacquer-enamels with which the masks of Pautiwa and the six Shalakos were painted. The smoke powder was specially prepared by Shannon, and when heated gave off a thick smoke hardly noticeable under ordinary light, but fluorescing in a ghostly green under ultra-violet.

The "black Light," or near-ultra-violet radiation, for activating these fluorescent materials was projected from the grandstand roof by means of the two arc spotlights equipped with Corning 6½-in. square black-purple filters, the arc searchlite with two 12-in. red-purple filters and two 250-watt floodlights using H-5 GE mercury lamps and 12-in. red-purple filters. These filters passed almost no visible light and brilliant fluorescence was obtained up to a distance of about 75 ft. with the spots and floods, and up to 150 ft. over a small area with the arc searchlight. Several types of filters, tried with the arcs, were rejected because too much visible light was transmitted.

All lighting was controlled from the roof platforms, seven operators being required during the show. On each platform were the controls for the adjacent end tower, consisting of a switch for each of the five floodlights, and switch and dimmer controls for half of the center tower floods and footlights. Regular dimmers were not available, so carbon-pile resistors were made using thin discs cut from old ¾-in. arc carbons, piled inside of 1-in. iron pipe lined with sheet asbestos. A pressure screw at one end enabled the operator to vary the resistance and dim the lights. A bank of four of these dimmers was mounted on each platform, each dimmer controlling a load of about 3,500 watts, and each provided with a disconnect and a shunt switch. Circuits were divided by colors so that each color could be controlled and dimmed separately.

Much of the wiring and control equipment was of a temporary nature, and was kept as simple and inexpensive as possible, since one performance a year hardly justifies a very elaborate installation. Nevertheless, the committee was able to obtain, by makeshift or otherwise, all the effects they set out to accomplish and incidentally, some valuble lessons in the practice of ingenuity.

British Columbia has a Boom

Sales of major appliances on the upswing as Canadians in northern province "ignore" war

WAR has brought a boom to the electrical appliance merchandising field in British Columbia. Not only have all past records been broken but the quota of appliance sales for the year set for 1940 has already been surpassed in every classification, with three of the best selling months in many lines still unreported.

For example, at the start of this year, the British Columbia Electric Railway Co. under its dealer co-operation program, mapped out quotas in each group of appliances for both dealers and retailers. All these quotas have now been far surpassed. Latest figures compiled are for the current year up to the end of August. During the same eight month period last year, 605 electric ranges were sold and this year the figure had jumped to 674. In electric ranges last year 830 were moved in the first seven months, against 901 this year. When September figures are added the year's quota has been passed. Sales by dealers alone, omitting the central station, were 334 electric ranges in the first eight months of 1939 as against 390 this year. All these figures and those that follow are for the Greater Vancouver area and Lower Mainland section of B.C. alone, comprising the cities and municipalities of Vancouver, New Westminster, Kamloops, West Vancouver, North Vancouver, Chilliwack, Abbotsford, Mission, Haney, and other points where the B.C. Electric dealer co-operation plan is in operation.

Refrigerator sales are possibly the most spectacular, achieving an all-time record, and going over the year's quota by 300 per cent in the first eight months alone. During the eight month period in 1939 a total of 1,593 refrigerators was sold but this year the figure has soared to 7,297 reported sales, with unreported sales known to be equally ahead of last year. These figures cover both central station showroom and dealer sales.

The jump in radio sales is equally substantial, and here all the sales have been made by dealers, as the B.C. Electric discontinued sales of radios, washers, and certain other appliances at the start of this year, in accord with a policy announced a year ago. The radio sales for 1939 during the January to August period totalled 5,675 sets and this year for the same period 7,297 sets were sold.

Two thousand washers sold in the eight opening months of 1939 increased to 2,181 during that period this year. Ironer sales were much smaller, showed a very much higher percentage of gain, and vacuum cleaner sales were also well in the lead. Sales of smaller appliances are also far ahead of 1939.

Some indication of the volume in terms of dollars can be gained from the fact that the sales by dealers of major appliances alone, and entirely disregarding such sales by the central station, amounted to a total of $378,000 ahead of the sales total for the corresponding eight months of 1939.

However this gigantic sales increase is only half the story. It is agreed by all that the figures would be very much higher if the dealers and the central station were able to give delivery of all appliances actually sold. Every dealer in British Columbia has a back-log of appliance orders waiting to be filled as rapidly as he can get his own orders filled by the manufacturers.

Just what caused this abnormal demand for electrical appliances is somewhat difficult to determine. Part of it is the result of the war, and part the result of more aggressive and carefully planned merchandising campaigns. As regards the campaign work the dealer co-operation policy of the B.C. Electric and the activities of the Home Appliance Council of the Electrical Service League of B.C. are largely responsible. As far as war factors go, possibly the two major considerations are the vastly increased general prosperity of British Columbia, and the very generally held belief in the west that money in itself will be worth less later than today, and hence it is good business to invest in stable commodities. This is in no sense a feeling of panic. The western population of Canada is calmly confident of the future, but many of the public feel some change must come in the existing economic situation, and they believe such a change will be reflected in a degree of monetary reform. To avoid any decrease in the value of their money they are sinking it in real estate, in automobiles, in electrical appliances, in home modernization of various types, and in general expenditures for lasting commodities. The very fact that B.C. citizens are making such investments, however, is a definite proof of their confidence. Others, again, seek increased business prosperity ahead and feel they are in a position to meet payments on appliances and other commodities which they have long desired, but could not previously afford.

Advertising of electrical appliances has shown a very heavy increase. Under its dealer co-operation plan this year B.C. Electric announced that it would pay 100 per cent of the advertising costs of dealers up to the value of credits they had on the company's books. These credits were in the nature of allowances for sales made, for example a five dollar allowance is made to the dealer for each range sold, $2.00 for each refrigerator, etc. In the past the central station only permitted dealers to use these allowances for advertising when they personally paid a portion of such costs. During the present year bearing all costs of advertising up to the credit of the dealer the central station has paid for advertising by dealers, as such has been used to an amount far in excess of last year. Excess profit taxes have also had the effect of increasing additional advertising by dealers themselves in some instances.

War has of course taken many young men from the electrical industry, as it has from all others, but there is not as yet a serious shortage of salesmen in the appliance field in B.C. In the electrical contracting field this shortage has become noticeable, but as there was previously an over supply of skilled and semi-skilled electrical labor this thinning of the ranks has created no problem. Electrical contractors, however, are busier than at any previous period in their career, and there is ample indication that present boom in new residential wiring will be maintained throughout the winter.

Taken as a whole, the war, instead of adversely affecting the electrical industry in B.C., has played an important part in developing it to a degree of prosperity never previously attained.

This Way to the Big Show

San Francisco store stages "circus" with PG and E help and moves many appliances

FOR THE fourth consecutive year, Circus Day at the Arc Electric Co., San Francisco, has rung the bell. Any stunt that will produce $5,000 in sales in one day certainly is worthy of note. Messrs. Guido and Frank Menicucci, proprietors of the company, in cooperation with the dealer sales promotion department of Pacific Gas and Electric Co. hit upon the Circus Day idea several years ago and each year since it has gained momentum and hung up greater sales.

Open house with continuous demonstrations is held from ten in the morning until seven in the evening on a Saturday during the Fall of the year. The Circus theme is carried out with balloons, soft drinks, refreshments and a gift for all those who present invitation cards previously sent out. These cards constitute an excellent prospect list for future use and are diligently followed up. This year with an estimated attendance of 900, over 300 gifts were passed out.

The Menicucci's feel that this promotion is their best medium of expressing good will among their customers and that the time and effort and the small expense involved are exceedingly well worth while. Frank Menicucci rang the cash register for more than $1,000 as a result of his own personal sales effort during the day. Included among the sales of the store personnel as a whole were the following items: 7 radios; 3 vacuum cleaners; 1 water heater; 1 dishwasher-disposal sink and electric range as one sale; a number of small appliances and some $500 in lighting fixtures.

Last year as a result of the demonstration on the Coffee Master, 30 coffee makers at $16 each were sold at Christmas time. From the interest displayed even greater sales are predicted for this year.

The proprietors of Arc Electric gratefully acknowledge the fine cooperation of the several distributors of appliances who participated and are unstinting in their praise of the P. G. and E. Dealer Sales Promotion Dept. They state frankly that they leave the entire planning of the party and all arrangements to this department and that without the fine work of its staff, particularly that of Mrs. Filsinger, appliance counselor of the dealer sales promotion department, they would be unable to handle the many details involved in such an undertaking.

In commenting on Circus Day, Guido Menicucci said, "We liked the idea when it was first suggested by the sales department of the utility, but because of the amount of detail involved in such an event we were almost afraid to tackle it. However, with the assurance and help of P. G. and E. we went ahead and now after the fourth successful annual Circus Day we are more than pleased with results. It creates business; it promotes good will and it gives us an opportunity to do something for our many friends and customers."

B. C. Electrical Bazaar

"Demonstration Week" was staged at the main showrooms of the British Columbia Electric Railway Co. recently as a means of drawing the latest in electrical appliances to the attention of the public at Vancouver B. C.

The main floor of the big showroom of the utility was turned into an electrical bazaar, with many free samples offered. A health centre featured sun lamps, infra-red lamps, vibrators, hot pads, and hairdryers, each in itself attracting much attention. The general appliance section featured the new steam-electric iron, and the lighting centre had as its stellar attractions the new reflector bowl lamp globes and the new vision-aid adapter unit.

With postal card invitations sent to a select list of 800 customers, the Arc Electric Co. in San Francisco turned their store into a "sawdust ring" for a one-day event. Balloons and free soft drinks helped to carry out the carnival spirit, while demonstrations such as the one on the ironer (at right below) held the attention of the crowd and sold merchandise

Door to Door

Southern California salesman "sells" neighborhoods

Curtis Turner, outside salesman for the Brown and Weber Co., Alhambra, Calif., dealers in electrical appliances, during the last 18 months has tried out a plan of calling every week on every home in a certain section of a given street,—56 houses in all, a section about two blocks in length. Rain or shine, warm or cold, he has made those calls each Monday morning. If he has done nothing else he has said "Hello!"

The results are just as he thought they would be—a major appliance sold in nearly every one of those 56 houses with washing machines and console radios the two big sellers.

Turner then started on a second group consisting of 125 homes strung along three or four blocks on another street. A few months passed and he had 25 major appliances chalked up.

"In starting in on those first two blocks of 56 houses," Turner said, "I determined not to stop until I had made a sale. It took me more than a solid week to make my first sale, then I sold a washing machine for $59.50. The next sale came easier, and the third easier yet. The time came when I knew every family and then no one resented weekly calls. That was simplified by the fact that my early sales were scattered here and there along the street so that I had to make the entire stretch anyway. "In addition to major appliances I have sold a number of electric flatirons and a few other minor appliances."

"I am satisfied that there is no street in the Los Angeles area where the percentage of homes with such appliances would run higher. Personally I am sold on persistent weekly calls. I believe the psychology is the same in my line as in any other line."

Hostess House

Matchless home kitchen center of electric-cooked luncheons

In a demonstration kitchen and hall where club groups are invited for electrically-cooked luncheons Mrs. Ethel Rogers, well known home economist, entertains in the Matchless "Hostess House" in Los Angeles. Since its opening in April, 1940, more than 1000 women have visited this home which is sponsored by Westinghouse Electric Supply Co. and associated dealers. A sales plan has been worked out in connection with the luncheon and bridge parties held at the Hostess House so that each club has an opportunity to make some money for their club treasury.

Mrs. Rogers and her assistants prepare a meal before the eyes of their guests, and thus they see how efficient electric cookery can be. She declares that many of the women have actually helped her to prepare and cook food in the electric ranges and have left enthusiastic boosters of this type of cooking.

● NEW HOTPOINT DEALER in Lewiston, Idaho, is Weldon Wasem, who recently converted the tea room in his drugstore into an electrical department. Managing will be Bob Mevig, with Clyde Bowman, Paul Schurmann and Louie Stohs as sales personnel. To mark the opening, a cooking class was held for salesmen and wives in the new department. The demonstration was conducted by Jean Dunkle and Ethel Yeager, home service advisers with the Washington Water Power Co., who also served dinner after the meeting.

● UNIFORM RANGE WIRING ALLOWANCES have been agreed upon by the Los Angeles Bureau of Power & Light, Southern California Edison Co., and the municipal utilities of Pasadena, Glendale and Burbank. These allowances will be $20 for the first unit of either range or water heater and $10 for the second unit installed. This move was made to salvage something tangible from the former Electrical Development League through which the only joint action between these private and municipal utilities had been promulgated.

New Sales Plan

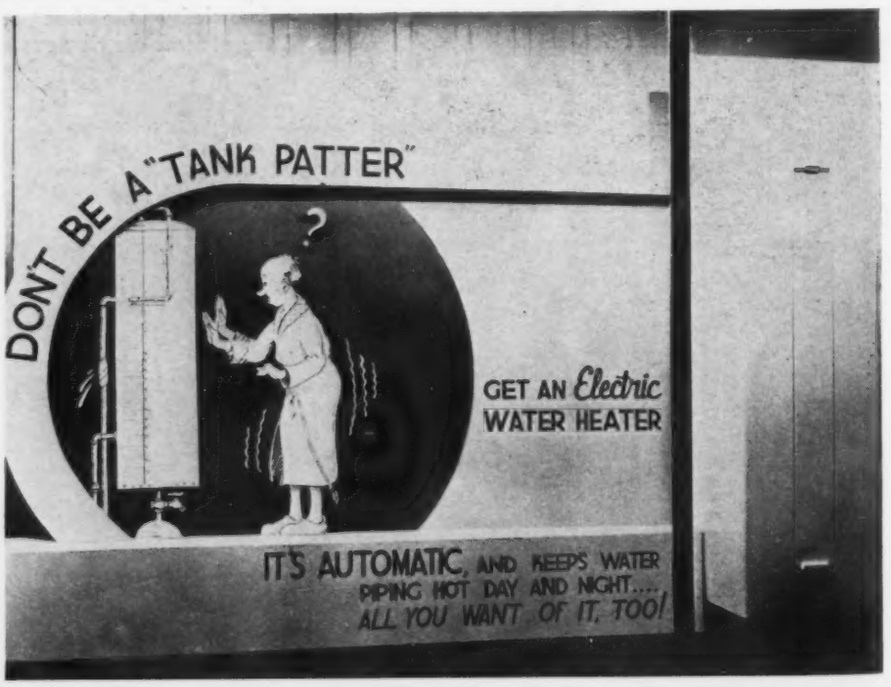
Edison Company sells roasters by home demonstrations

A new plan of selling roasters by home demonstrations is being tried out this month by the Southern California Edison Co. The demonstrations are made by a home economist or an employee who has been trained for the work.

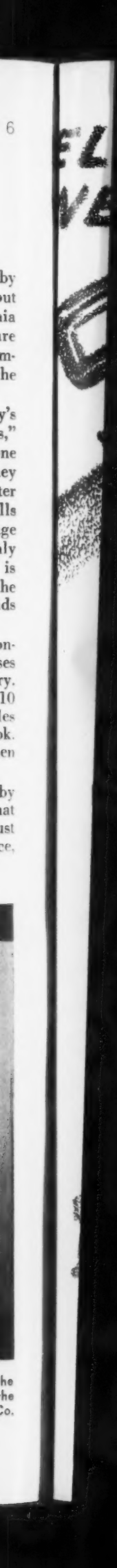
The October issue of the company's consumer magazine, "Electrical Times," invites Edison customers to telephone or write their Edison office if they would like a demonstration of a roaster in their home. The demonstrator calls with a roaster, cake tins, and a package of ready-mixed cake flour to which only water need be added. The cake is baked in the roaster to illustrate the excellent results obtained with all kinds of roaster cooking.

Employees interested in doing demonstration work were trained in classes held in all divisions of Edison territory. "How to Demonstrate a Roaster in 10 Easy Pages" is the title of the sales directions which served as textbook. The usual employee bonus is paid when a demonstration results in a sale.

"This activity is being sponsored by the Edison Co. because we believe that to obtain sales volume, a roaster must be demonstrated," states H. C. Rice, manager of domestic sales.


DON'T BE A "TANK PATTER"
GET AN Electric WATER HEATER
IT'S AUTOMATIC, AND KEEPS WATER PIPING HOT DAY AND NIGHT.... ALL YOU WANT OF IT, TOO!

This animated figure of a shivering householder waiting for the old tank to get hot was the center of attention in this second prize window in a window display contest sponsored by the Modern Kitchen Bureau. Window was built by J. K. Newport, display dept., The Idaho Power Co.



PRINT IN BINDING

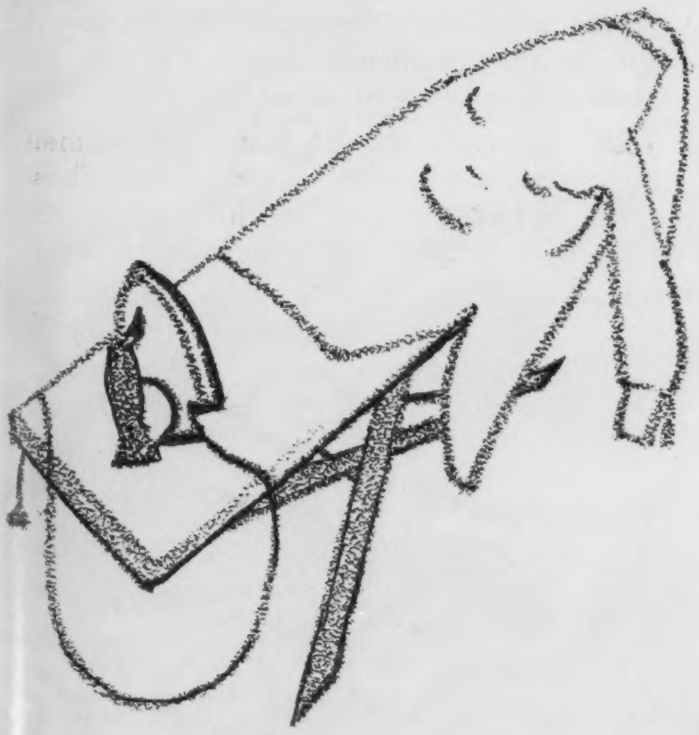
ELECTRICAL WEST

SALES GUIDE

THAT OLD SMOOTHIE

(the automatic iron)

It irons out the wrinkles in sales volume, it has features to sell, it is worth selling



Ordinary irons keep on selling year in and year out. People buy them. Nobody tries to do much selling. They are staple merchandise. In fact everybody seems to have some kind of iron in stock. There is no challenge to your ability just wrapping them up for customers who come in and buy any old iron. **But with the automatic—that's different.**

Here you have a real test, a real satisfaction in making the sale. It has features to talk up. It has special advantages to offer.

Besides, it is more profitable. There's more net to less volume. There's margin enough to do some advertising, to put out extra effort. There's a good market for it too. Only about 20 per cent of the irons in use are automatic. That leaves you from 60 to 80 per cent of those using irons to sell up to. Even if the regular iron has reached saturation, why not sell all the replacements an automatic instead. Inside you'll find quick ideas to tell your customers **why** they should pay the difference and enjoy an automatic.

AUTOMATIC IRONS

DECEMBER 1940

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OH, BY THE WAY—

When you've only

What you say must be quick. It must strike a response. It must stop the rush to get the iron bought and over with—long enough for you to tell your story of automatic iron advantages.

Ironing is not much fun. It means standing on tired feet. It is a chore or a duty that she wants to do and forget as fast as she can. That gives you your cue, your appeal.

You have only one sentence, one question, usually, in which to stop her. No matter if her first question is to "see some irons", or "what is the price of this iron," or merely a statement that she wants this or that iron, this one question on your part may give you the opening you need to tell her the rest of the story.

"Have you thought how much MORE you'd get from an automatic iron? Let me explain—"

Tested by many salesmen and saleswomen that simple question has proved to be a "hesitator", an opener from which to go on and tell the rest of the superiorities of an auto-

SUGGESTED BY

PRINT IN BINDING

matic. Just in case you may have forgotten them, here they are, said in a way to follow up that question.

"It's so much safer—just set the control and you know it will stay just the right temperature. Even if you leave it on by accident, it won't do any damage."

"It's so much lighter—and that means it saves your strength. Feel how light it is in comparison to an ordinary iron. Multiply that weight by the number of times you must lift an iron while ironing and you can appreciate how much of your energy you can save."

"It's so much sturdier—much better materials are put into an automatic to give it **lasting** quality. Take just the cord, for example. It is permanently fixed so that you do not have to pull it off and put it back on. The heat control keeps it just the right temperature for you. This feature protects the iron itself against overheating, keeps the shoe bright and smooth its entire life, and by the way, it eliminates radio interference too."

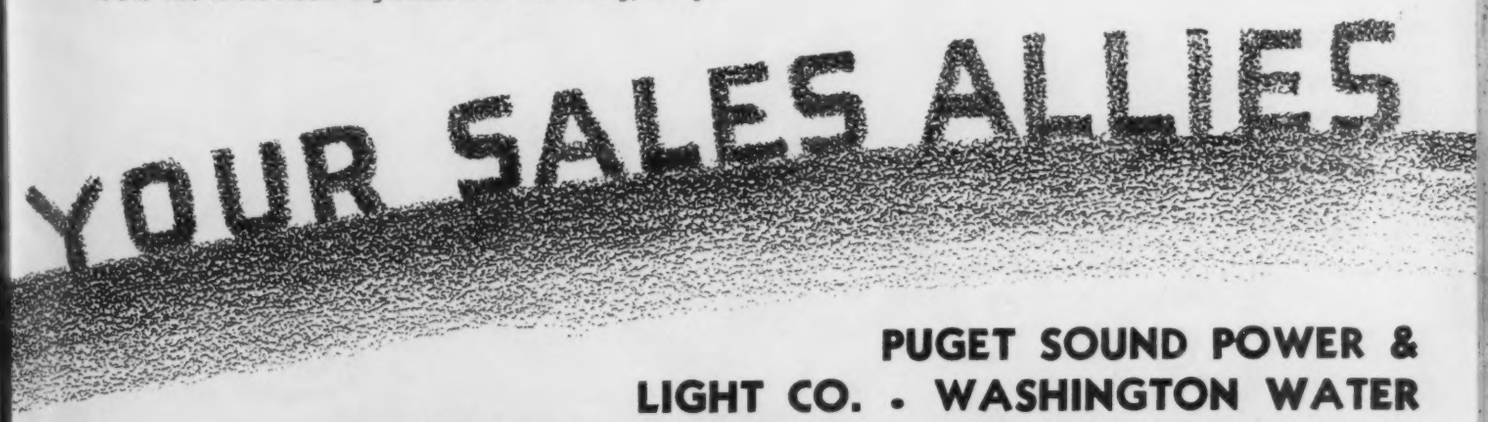
"It's easier to use—besides being light in weight, it is better balanced, and steers more easily through materials. Even if you have an ironer this is useful in sewing, to smooth seams, take out wrinkles, iron ruffles or edging."

"It keeps white clothes white much longer—Too hot an iron is bound to scorch your clothes and no matter how careful you are it is hard to hold temperatures with a non-automatic iron. White things turn yellow. With an automatic this will not happen."

"It protects rayons—your pretty rayon and synthetic silk materials are very critical to heat. An automatic iron is almost a necessity to protect them."

"It heats so fast—and that saves you money as well as time. Takes just a few seconds to heat up, turns off the current itself, turns it on only when it needs it, and so saves current. Saves time because you do not have to wait for it to warm up; you can really take your time ironing and still get through faster."

a minute---



PUGET SOUND POWER & LIGHT CO. . WASHINGTON WATER POWER CO. . PORTLAND GENERAL ELECTRIC CO. CALIFORNIA OREGON POWER CO. . UTAH POWER & LIGHT CO. . IDAHO POWER CO. . THE MONTANA POWER CO. ROCKY MOUNTAIN ELECTRICAL LEAGUE

HERE'S AN IDEA

Tried and still useful promotions for the automatic electric iron include the combination offers, with an ironing board, or ironing board covers. The trial plan still works too, loaning a model to be used a few days, following up to sell it. Expose those who come in with an iron for repair to the automatic iron, tell its superiorities and try to sell it.

Demonstrate the automatic this easy way. Have it near an electric outlet. As you show it to the prospect, ask her to put her finger against the sole plate as you plug it in. It will heat in a few seconds and she will take her finger away. Then say, "Doesn't it heat up quickly? That fast heating saves you money and time." From there you can tell why and talk of its other advantages. The speedy heating will go a long way toward convincing her. She has felt. She knows it's so.

An idea to protect the sole plate of display irons from scratching is told by Elbert Kramer of Westinghouse, (who advocates the above demonstration). Cut a circle of blotting paper about a half inch around, fasten it to the two heel corners and tip corner of the iron with scotch tape. It will protect the plate by lifting it up slightly.

YOU MIGHT TRY

Campaign

Christmas season activities keep utilities stepping

Annual holiday drives on both large and small appliances are under way, with many companies continuing regular campaigns in conjunction with extra efforts to secure Christmas business. Here are a few:

Brit. Col. Electric Railway Co., Ltd.—Annual Christmas gift activity on all appliances; introduction of 1941 Dealer Cooperative Plan.

Central Arizona Light & Power Co.—Residential lighting promotion for December and January.

Nev.-Calif. Electric Corp.—Range and water heating campaign for December. Washers and Ironers for January.

Pacific Gas and Electric Co.—Range and water heaters are receiving full industry promotion. This promotion includes a cooperative advertising offer and increased trade-in allowances on old equipment. Under this promotion, the company is paying one-third of newspaper advertising costs of dealers.

Pacific Power & Light Co.—Light conditioning advertising was continued through November with electric cookery promoted around Thanksgiving. Radio and billboards were used.

San Diego County Bureau of Radio & Electrical Appliances—Eighth Annual Electrical Show scheduled for Dec. 3-8. All space was reserved and the finest grouping of electrical things was anticipated.

Southern Calif. Edison Co., Ltd.—Electrical appliances for Christmas gifts were featured in November and were to continue in December. Hotpoint show "Blame it on Love," was shown eight times before women's clubs.

Southern Colorado Power Co.—Range and water heater and IES lamp campaigns were scheduled for December.

Utah Power & Light Co. and The Western Colorado Power Co.—Lighting, gift appliances and Christmas lighting promotion was to be conducted in December.

Puget Sales Plans

Effective Jan. 1, Puget Sound Power & Light Co. is discontinuing the sale of electrical equipment outside of the Seattle area. This is in line with the company's policy of turning electrical appliance and equipment sales over to dealers whenever customer acceptance warrants and wherever competitive conditions permit.

Puget Power, according to Frank McLaughlin, president, will continue to supply advisory home, commercial, industrial, farm electrification and dealer cooperative services for the benefit of customers and dealers.

McLaughlin declared that "new low Puget Power rates, plus the ability of dealers in our operating area in marketing electrical appliances, combine to see to it our mutual customers obtain the most for their electrical dollar."

● A NATION-WIDE CONTEST in All-Electric Kitchens is now being conducted by McCall's magazine. Called "McCall's Dream Kitchen Contest," this promotion is open to consumers and also to people engaged in kitchen-planning work. Prizes totalling $1,250 are to be awarded after the contest closes Dec. 31, 1940. These prizes are divided up into various divisions, such as "Best Kitchen Planned by a Student," "Best Kitchen Planned by a Homemaker," "Best Big Kitchen," "Best Small Kitchen," "Best Farm Kitchen," etc. A best kitchen from each state, including U. S. territories will be featured.

APPLIANCE SALES REPORT, 1940

A Summary of Dealer and Utility Reports Compiled by Associations, Societies, Bureaus, or Dealer Contact Departments of Utilities

REPORTING COMPANIES	Idaho Power Co.		Northwestern Elec. Co.	Montana Power Co.		P. G. & E. Co.	Pacific Power & Light Co.		San Diego Cons. G. & E. Corp.		Southern Calif. Edison Co., Ltd.		Utah Power & Lt. Co.		Wash. Water Power Co.
	Curr.	10 Mos.	Curr.	Curr.	10 Mos.	Curr. 6 Mos.	Curr.	9 Mos.	Curr.	9 Mos.	Curr.	10 Mos.	Curr.	10 Mos.	
Ranges	229	3,403	586	193	2,250		278	1,988	60	440	154	1,513	406	3,178	
Water Heaters	137	1,390	260	17	264		134	1,190	50	390	44	483	49	734	
Air Heaters, aux.															
Air Heaters, 220															
Refrigerators	259	7,937	792	298	9,592		494	7,903	825	8,800	2,954	40,335	677	12,829	
Dishwashers	1	14											5	27	
Washers	457	4,753	939	506	5,286		538	5,285	550	4,075	3,145	25,314	882	7,967	
Ironers	37	291		56	590		54	402	100	650	395	3,198	51	529	
Vacuum Cleaners	128	1,531	483	224	2,260		143	1,442	300	2 385	960	8,969	463	4,661	
Radios	1,248	8,990	2,839	2,648	13,274		1,477	10,730	1,475	9,450	7,394	56,097	11,984	14,040	
Mixers	81	693							150	990	215	2,310	153	1,177	
Cookers, Casseroles	46	405		36	439				85	590	55	357	39	177	
Irons	705	6,294							550	4,600	1,123	9,806	1,159	8,948	
Waffle Irons	158	1,411							200	1,235	423	3,264	381	2,902	
Toasters	303	2,670							550	3,825	527	4,683	580	4,904	
Table Stoves	237	4,031	2,808	799	6,967				85	815	125	1,820	308	3,396	
Heating Pads	120	810							50	935	224	1,332	177	1,773	
Curling Irons											36	287			
Coffee Makers	320	2,407							500	4,175	245	2,443	470	3,628	
Sewing Machines									175	1,125			264	1,385	
Clocks	199	1,569							600	4 400	544	4,532	353	2,615	
Fans	23	2,476	178								69	2,362	298	2,139	
Floor Polishers															
Sun Lamps	21	217									20	247	17	66	
Reflector Lamps															
Misc. Lamps															
Shavers											291	1,834			
Yard Lights													20	337	

SOURCES

[1] Figures compiled by Electric Equipment Sales Association. Include power company sales of all reporting dealers for 3 months.

[2] Lists appliances sold by dealers in Portland area. Figures compiled by Northwestern Electric Company.

[3] Combined dealer and company sales from report of Montana Power Co.

[4] Figures are being consolidated with San Joaquin Power and are not available this month.

[5] Gathered by Bureau of Radio and Electric Appliances of San Diego County. Estimated monthly sales figures used in this table: Miscellaneous figures include fans, curling irons and sun lamps.

[6] Includes reports from dealers on San Joaquin Valley system of company as well as Southern California areas served.

[7] Includes Utah Power & Light Company territory in Utah, Idaho and Wyoming. Also Western Colorado Power Company territory.

Predicting Load with "No-Growth Curve"

Method yields monthly estimates for year ahead. Per-cent error for any month is less than 1.5 times error for year

By P. D. Jennings

Puget Sound P&L

ANNUAL energy predictions for a year in advance are usually correct within 2% during years in which the load is steadily growing, as, for example, 1925-1929 and 1934-1937. The monthly estimates of the energy within the year are not so close. These monthly estimates, however, are very important to systems operating mainly on hydro facilities, relayed with steam during low water periods. An error of 5% in a load estimate of one of these low water months may mean an error of 100% in the fuel consumption estimate for the same month.

The purpose of this article, therefore, is to outline a method used by the engineering department of Puget Sound Power & Light Co. to improve the accuracy of its future monthly load estimates. The principles of the method outlined were suggested by Mr. Quinan, chief engineer of the Company, and described by him in a paper delivered before the Northwest Electric Light & Power Assn. in 1933. Since then, the writer has improved and augmented the technique, and the improved method is the one we are about to describe.

Prior to its use, the Company's monthly energy estimates for a year in advance were considered sufficient if the maximum percent error did not exceed five times the per cent error in the annual energy estimate. Today, under the new method of estimating, the ratio has been reduced from the five-to-one ratio to about one and one-half to one.

The reason the older method of estimating was not so accurate was that monthly allocations of annual energy estimates were based on the monthly ratios of the previous year. Obviously, this method will not be accurate if a change in per cent of annual load growth is anticipated for the coming year. It was realized that if there was some method of determining (as a basis for a measuring stick) the monthly energy that would exist if there were no growth in load, we would be able to make a more accurate prediction of future monthly energy.

"No-Growth Load Curve" Conception

Let us assume that at midnight, December 31, of the current year, no further connected load is added to the system, and furthermore the energy activity of the status-quo connected load does not change subsequent to this date. Obviously, subsequent monthly energy values will vary only through seasonal activities of business; and year after year the same energy and, therefore, energy ratios between months will exist.

Such monthly energy values, if plotted, and the points connected will give the so-called no-growth load curve.

Table II—Energy Load Estimate of 1941 Based on the Assumption of an 8% Uniform Growth Over 1940

Month	(1) No Growth Activity Ratios (See Col. 7) (Table I)	(2) Equivalent Week Days 1941 **	(3) Monthly No Growth Activity for 1941 (1) x (2)	(4) $\frac{e^{rtn} - e^{rtn-1}}{r(tn - tn-1)}$ *	(5) Monthly Growth Activity for 1941 (3) x (4)	(6) Annual Monthly Allocation Ratios for 1941 Col. No. 5 Arranged as a Percentage of the Total	(7) Annual Load Estimate 1941 Allocated by Months per Col. No. 6 in MWH
January	8.707	29.299	255.106	1.0033	255.948	8.572	116,277
February	8.347	26.393	220.302	1.0095	222.395	7.448	101,031
March	8.061	29.205	235.422	1.0158	239.142	8.009	108,640
April	7.874	28.564	224.913	1.0224	229.951	7.701	104,463
May	7.976	29.205	232.939	1.0290	239.694	8.027	108,885
June	7.876	28.299	222.883	1.0356	230.818	7.730	104,856
July	7.870	29.299	230.583	1.0423	240.337	8.049	109,183
August	8.562	29.205	250.053	1.0492	262.356	8.786	119,180
September	8.782	28.299	248.521	1.0559	262.413	8.788	119,207
October	8.738	29.564	258.330	1.0626	274.501	9.193	124,702
November	8.618	27.940	240.787	1.0696	257.546	8.625	116,996
December	8.589	29.299	251.649	1.0764	270.875	9.072	123,060
TOTALS					2,985.976	100.000	1,356,480

** Note each value = number of week days per month + 0.906 × number of Saturdays per month + 0.735 × number Sundays and holidays per month. (Saturday, February 22, was listed as a holiday instead of a Saturday).

* $P = 1.08$

$$r = \frac{2.3026 \log_{10} (1.08)}{365} = \frac{2.3026 \times 0.0334238}{365} = 0.00021085$$

$t_{12} = 365$.

Table I—No-Growth Load Curve Data for the Years 1934 and 1935

Month	(1) Actual System Energy in 1934 MWH	(2) $\frac{ertn - ertn-1}{r(tn - tn-1)}$*	(3) No Growth Energy per Month MWH (1) ÷ (2)	(4) Equivalent Week Days**	(5) No Growth Energy per Week Day in MWH (3) ÷ (4)	(6) No Growth Monthly Activity Ratios Col. 5 Arranged as per cent of Total	(1) Actual System Energy in 1935 MWH	(2) $\frac{ertn - ertn-1}{r(tn - tn-1)}$*	(3) No Growth Energy per Month MWH (1) ÷ (2)	(4) Equivalent Week Days**	(5) No Growth Energy per Week Day in MWH (3) ÷ (4)	(6) No Growth Monthly Activity Ratios Col. 5 Arranged as Per cent of Total	(7) Mean Values of the 2 No. 6 Columns
January	73,218	1.0034	72,970	29.299	2.491	8.749	78,192	1.0030	77,958	29.299	2.661	8.666	8.707
February	68,595	1.0099	67,922	26.299	2.394	8.408	67,529	1.0091	66,920	26.299	2.545	8.287	8.347
March	68,325	1.0164	67,223	29.470	2.281	8.012	73,821	1.0148	72,744	29.205	2.491	8.112	8.061
April	65,081	1.0232	63,605	28.299	2.248	7.895	70,346	1.0209	68,906	28.564	2.412	7.854	7.874
May	69,764	1.0302	67,719	29.299	2.311	8.116	72,401	1.0272	70,484	29.299	2.406	7.835	7.976
June	67,029	1.0370	64,637	28.470	2.270	7.972	69,644	1.0334	67,393	28.205	2.389	7.779	7.876
July	68,430	1.0439	65,552	29.034	2.258	7.930	73,050	1.0396	70,267	29.299	2.398	7.809	7.870
August	77,451	1.0513	73,672	29.564	2.492	8.752	79,487	1.0459	75,999	29.564	2.571	8.372	8.562
September	78,630	1.0582	69,580	27.940	2.490	8.745	79,877	1.0523	75,907	28.034	2.708	8.818	8.782
October	77,174	1.0653	72,443	29.564	2.450	8.605	85,275	1.0587	80,547	29.564	2.724	8.870	8.738
November	71,886	1.0725	67,027	28.299	2.369	8.320	82,252	1.0651	77,225	28.205	2.738	8.916	8.618
December	78,560	1.0795	69,995	28.940	2.419	8.496	82,938	1.0716	77,396	29.034	2.666	8.682	8.589
	851,143				28.473	100.000	914,812				30.709	100.000	100.000

** No week days + 0.906 × number of Saturdays + 0.735 × number of Sundays and holidays.

The following holidays are considered: New Year, Washington's birthday, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas.

* Ratio of 1934 annual energy to 1933 annual energy = 1.0833.

$$r = \frac{2.3026 \log_{10} (1.0833)}{365} = 0.0002192$$

* Ratio of 1935 annual energy to 1934 annual energy = 1.0748.

$$r = \frac{2.3026 \log_{10} (1.0748)}{365} = 0.0001976$$

The drawing of this load curve is really not essential for the use of the method, but it was used primarily to illustrate the method in the paper submitted by Mr. Quinan. The tabulated values are all that are really necessary.

Obtaining Curve Data

We first examine a number of years of load energy and select consecutive years in which a percentage of annual energy of one year over the previous year is approximately the same. For these years we assume that the percentage load growth for the year is uniform. Therefore, if we let

C_1, C_2 and C_3 = the monthly load energy, *including* load *growth* in kilowatt days, for the first, second and third months, etc.

B_1, B_2 and B_3 = the monthly load energy *excluding* load *growth* in kilowatt days for the first, second and third months, etc.

A = the connected customer load in kw. on midnight of December 31.

k_1, k_2 and k_3 = the activity factors of the connected load (A) for the respective first, second and third months, etc., (average demand factor ÷ conversion factor from customers' premises to generating plants).

t_1, t_2 and t_3 = the time in days from December 31 to the end of the first and the end of the second and the end of the third month, etc.

P = the percentage load growth per annum expressed as a decimal fraction.

e = base of natural logarithms.

n = the subscript for the (nth) month.

$$B_1 = k_1 A\ (t_1 - o) \qquad P = e^{rt_{12}}$$

$$B_2 = k_2 A\ (t_2 - t_1) \qquad r = \frac{2.3026 \log_{10} (P)}{t_{12}}$$

$$\cdot \qquad \cdot \qquad B_n = k_n A\ (t_n - t_{n-1})$$

$$\cdot \qquad \cdot$$

$$B_{12} = k_{12}A - (t_{12} - t_{11})$$

$$dC_n = Ak_n e^{rt} dt$$

$$C_n = Ak_n \int_{t_{n-1}}^{t_n} e^{rt} dt = \frac{Ak_n}{r}(e^{rt_n} - e^{rt_{n-1}})$$

Equation No. 1:

$$Q_n = \frac{C_n}{B_n} = \frac{e^{rt_n} - e^{rt_{n-1}}}{r\,(t_n - t_{n-1})} = (1 + \frac{r(t_n + t_{n-1})}{2} + \frac{r^2(t_n^2 + t_n t_{n-1} + t_{n-1}^2)}{6} + \ldots$$

After the calculation of the value of 'r' we are in a position to calculate the values of 'Q' (one for each month). Then, by dividing these values of 'Q' into the respective values of 'C', we obtain the 'B' values, which when plotted will give our 'no-growth load curve'.

The values of 'B', as illustrated here, are in kilowatt-days, but the values of 'C' might be tabulated in kilowatt-hours or megawatt-hours, or any other energy unit; and values of 'B' will be in the same unit. The reason this statement is valid is because an examination of equation No. 1 will show that the various values of 'Q' are entirely independent of the time units used in the 't' values, as (t) and (r) are inversely proportional to each other for different unit values of (t).

In the practical application of the method the value of the *mean no-growth load energy* for an *average week day* is a more useful figure than the *no-growth monthly energy*. This former figure is obtained by dividing the 'B' values by the equivalent number of week days in the specific month. The *equivalent number of week days* per month are determined as follows:

An analysis of many years of the Company load curve shows that the energy on Saturday is about 90.6% of the energy on an average week day; and the energy on Sundays or holidays is about 73.5% of the energy on an average week day. Consequently, the equivalent week days for the month are considered as a summation of all the week days in the month plus 90.6% of the Saturdays in the month plus 73.5% of the Sundays and holidays in the month.

The application of the principles above enumerated are given in Tables I and II.

Table I shows the development of "no-growth activity ratios" based on the load data of Puget Sound Power & Light for the years 1934-5. The reason these two years were selected is because the annual load growth is respectively 8% and 7.5%, which are reasonably close. The activity ratios for each of the two years are averaged to obtain the no growth activity ratio to be used in the future load estimates.

Table No. II shows the method of making the energy prediction for the year 1941.

Conclusion:

The two tables illustrate the application of this method to future monthly load estimates. The fundamental accuracy of the estimate will depend largely on the care with which the annual estimate is made, and the period for which the assumption of uniform percentage load growth can reasonably be anticipated. Usually, depressions and abnormal conditions caused by the war, etc., make load estimates, in excess of one year, of doubtful value. Also experience shows that every few years the *no-growth activity ratios* should be checked to determine if they are still applicable to current load conditions. Our past experience shows that a set of activity ratios are useful for at least five years.

Substation going up on interconnection between So. Cal. Edison and San Diego systems

New Tie Line

So. Cal. Edison Supplies San Diego

To meet increased electrical demands in the San Diego area stimulated by national defense operations, agreements have been made between the Southern California Edison Co., Nevada-California Electric Corp., and the Los Angeles Bureau of Power and Light to supply the San Diego Gas and Electric Co. with 35,000 kw. of 60 cycle power by Dec. 1, according to Fred B. Lewis, Edison vice-president and general manager.

Several months ago a contract was signed for the Edison Co. to supply 37,000 kw. of power to the San Diego company. However, the frequency changing equipment at Edison's Chino sub-station which will change Edison's 50-cycle power to 60 cycles for San Diego's use will not be ready until about July 1, 1941. The new arrangement supplies San Diego's needs in the interim.

Power will be received by the San Diego Gas and Electric Co. over a new transmission line between San Diego and the Edison sub-station at Chino, built to fulfill requirements of the 37,000 kw. contract. Edison will receive the 35,000 kw. of 60-cycle power over the Seal Beach-San Bernardino line of the Nevada-California Electric Corp. This line passes four miles south of the Chino sub-station and will be linked to the station by a new line now under construction. The Bureau of Power and Light, Los Angeles, will generate 60 cycle power for this purpose at Boulder Dam and will transmit it to Seal Beach over the Bureau's Boulder Dam transmission line.

Lightning Geography Is Key to Protection

Studies of storm occurrance show lightning distribution in California. Protection desirable in selected areas

By W. C. Smith and A. F. Ayres

G-E CO., San Francisco Nev-Cal Electric Corp.

IN RECENT years, the application of lightning-protection equipment to distribution and high-voltage circuits has reached the point where it can be carried out on quite a rational basis. Contributing to this are several factors, not the least of which is a better understanding of the nature of lightning and of the impulse strength of the insulations employed in modern apparatus.

A year ago, the statement was made that "lightning protection is justifiable when the carrying charges on the protective equipment do not greatly exceed the cost of damaged parts of apparatus and the labor of replacing them, plus a proper evaluation of the service interruption to the consumer." Occasionally, of course, there is also to be added to the latter side of the ledger an appreciable loss of revenue.

On what basis is the utility to assign a proper value to a service interruption? In one case, it may mean merely the postponement of a certain irrigation pumping job for a few hours. But in another it might mean making a municipal fire-pump inoperative, or shutting down a factory process and thus causing heavy loss.

In evaluating a service interruption, separate consideration must be given to each type of circuit and often to an individual customer. In like manner, the labor of replacing damaged parts will vary over wide limits. Even though the damage is confined to transformer bushings and leads, or a fuse, remote location will involve high costs.

Illustrating the points just made, one utility reports as follows for a lightning storm in February of this year. "This same storm blew fuses on 22 distribution transformers and interrupted 40 customers in the A area. In a wide area around B, many transformers and sectionalizing fuses were blown, with outages to some customers amounting to 28 hours."

From information gathered by the U.S. Weather Bureau there appears to be a fair correlation between thunder storms and sun spots, the maximum and minimum of storms lagging one year behind the sun spot maximum and minimum. The cycles vary from 9 to 17 years in length, with an average of 11 years per cycle. Last year, in which the 1,510 forest fires caused by lightning broke all California records, was probably at the peak of the present cycle. In a given cycle, the variation in the number of thunder-storms will be some 250% for altitudes above say 1,000 ft., and up to 800% for lower altitudes.

The U.S. Weather Bureau's 30-year-average record, the period being 1901-1930, for number of thunderstorm days, shows one storm-day per year around San Francisco, three around Los Angeles, one in the San Joaquin Valley, three to five in the Sacramento Valley, running on up to five or ten in the foot-hills, and a maximum of 20 storm days per year around 4,000- to 5,000-ft. altitude.

Fig. 1 provides information relative to frequency of lightning storms in various areas of southern California. This map indicates a wide variation ranging from 3.8 days per year on which lightning storms are experienced near the seacoast to 24 days per year for a portion of the area traversed by some of the Boulder transmission circuits. The figures given are an average of the last five years' records of three utilities operating in southern California.

Each lightning storm appears to cause varying numbers of circuit interruptions to different operating companies. The average figures for one utility covering the last five-year period for circuits of various voltage classifications are shown in Table I.

This utility, as a whole, experiences seven interruptions per lightning storm day, based upon 44 storm days per year.

One other utility which operates principally near the seacoast averages 16.6 interruptions per year due to lightning. This represents only 2.4 interruptions per lightning storm day for the 6.8 average number of lightning storm days per year.

A third utility having more severe lightning exposure in desert areas and higher altitudes averages 4.9 interruptions per lightning storm day for its 57.6 lightning storm days per year over the entire system.

Illustrating the variations of conditions encountered is the authors' study

Table I—Lightning Outages

Average figures for one California utility throughout the last five-year period

Circuit kv.	Outages per yr.
2.3 to 7.0	49
11	159
16	36
33	7
66	50
220	6

Table II—Percent of Lightning Accidents to Number of Transformers Installed

District	Pct.	District	Pct.
A	0.05	H	0.19
B	0.33	I	0.02
C	0.26	J	0.21
D	0.32	K	0.03
E	0.02	L	0.54
F	0.10	M	0.27
G	0.15		

PCEA PAPER

This article was presented as an engineering paper before the 1940 meeting of the Operating Economics Section of the Pacific Coast Electrical Assn.

of several years' records covering lightning accidents to distribution transformers on one of the larger Western systems. A summary of this study shows the following, all figures being approximate only.

Over the 20-year period, 1920-1939, of all accidents to distribution transformers, those caused by lightning represented 21%, but this was an average per year of only 0.17% per transformer. Obviously, if lightning protection is to be justified at all on such a system, it can be done only after breaking down the figures into districts, in order to segregate some especially vulnerable areas. This was done with the average results for the past seven years. Shown in Table II.

Districts E, I, and K (Table II) are practically free from lightning. On the other hand, District L is relatively high. Analysis of L showed that a very large proportion of the damaged transformers were small units with low insulation values, built many years ago by a manufacturer now nonexistent.

District B, the next highest, was also checked, but the number of damaged units was found to be quite uniformly spread over the area. Approximately 40% of the accidents were on 2,300- and 4,000-volt transformers, and 60% on 6,900- and 11,000-volt transformers. The conclusion being reached that there were no especially vulnerable circuits, we made a rough estimate of the cost of protecting the entire District B, transformers. Annual charge of proposed arrester and ground installations would be approximately $24,000; yearly cost of replacing damaged transformers, as at present, approximately $8,000.

The practice of this particular utility in making no wholesale installation of arresters on distribution circuits thus has real justification. Certain restricted areas in the foothills around 2,000-to 3,000-ft. altitude, and somewhat isolated in character, are given protection, as well as many individual installations of special nature such as cable pot-heads. Such a practice, of course, leads to occasional instances where not only will a few transformers fail, but in addition a considerable area will be subjected to blown fuses.

Continuing the discussion of protection to distribution equipment, reports from other utilities represented agree that the principal equipment affected by lightning is the distribution transformer. One of the larger utilities reports that lightning damage to all distribution equipment, of which transformers are the chief item, averages approximately $18,000 per year. This utility has 83,000 distribution transformers connected to its system and loses approximately 0.1% per year due to lightning.

Two other utilities report annual lightning damage figures of $4,500 and $3,800 respectively. In the first instance, the utility has approximately 8,000 distribution transformers on its lines and loses 0.5% of them per year due to lightning.

None of the utilities has a set policy relative to the application of arresters to distribution transformers or circuits. All appear to follow the practice of using arresters in the areas most subject to lightning. A study of distribution transformer failures on the system of one utility having rather severe lightning exposures, indicates that the average per cent damaged annually by lightning varies from zero to 2.1, based on figures covering the last five years.

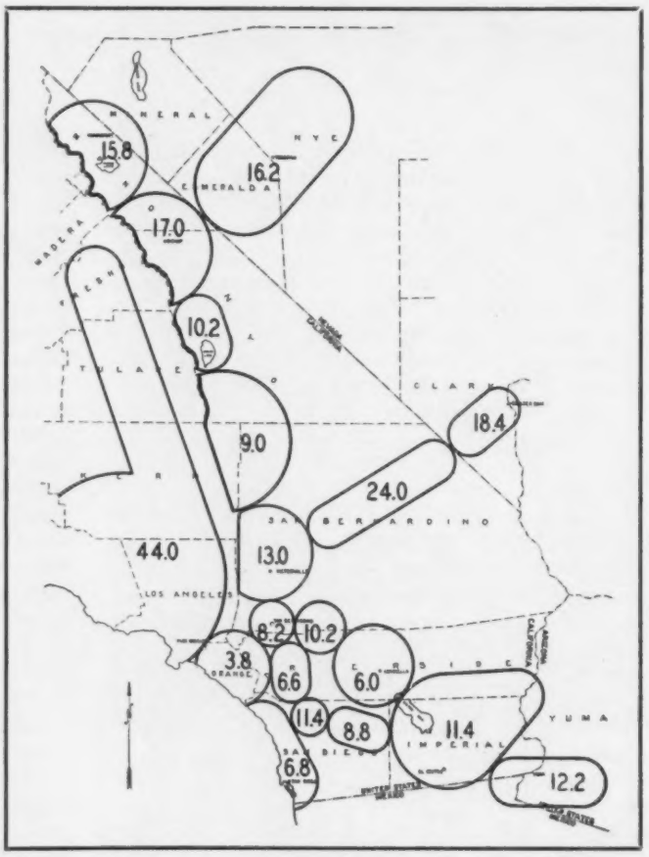


Fig. 1—Number of lightning storms per year in designated areas of southern California. Based on average of 5-year period ending 1939

For the three districts considered especially vulnerable to lightning where arresters are rather generally applied, the average failures are 0.4%. It would appear that the arresters may be responsible to some extent in keeping the failures of these chosen districts below the general system average. This study disclosed other districts having a rather high percentage of failures where consideration may be given to additional lightning protection.

In the semi-arid or desert areas served by these utilities, the matter of providing a dependable ground for lightning arresters is quite a problem. Tests by one utility indicated arrester grounds to vary from 5 to 100 ohms, generally, with some testing as 100 to 1,000 ohms. The importance of a low arrester ground can be greatly minimized through the use of some form of interconnection of arrester and secondary grounds.

The matter of type and age of transformer has already been mentioned. As would be expected, utility records indicate that the older designs of transformers are more subject to lighting damage than modern ones. Although smaller sizes are reported more frequently in lighting damage reports, it may be that the practice of not generally protecting such transformers with arresters partially accounts for this condition.

A rather new rural electrification project in one desert area subjected to an average of 11.4 lighting storm days per year was supplied with lightning arresters on all transformers in sizes of 7½ kva. and larger. Not a single lightning failure has taken place in any of these transformers in the three years they have been in operation. This project includes approximately 80 mi. of line and 70 of the transformers which have individual protection by lightning arresters.

In certain areas the matter of lightning damage to meters is of particular importance. This is so in agricultural pumping areas where secondary circuit exposure may be as serious as primary. One utility reports the use of 440-volt meter-protective arresters to have been particularly worthwhile. In one especially bad lightning area this company previously experienced as high

as 75% of the agricultural pumping plant meters damaged in a particularly severe season. Since the installation of arresters, this figure has dropped to 10%. As the cost of changing and repairing a damaged meter approximately equals the cost of installing an arrester, it can be seen that this feature alone provides economic justification. In addition, the matter of loss of revenue for such installations can quickly exceed the cost of lightning protection. The particular area under consideration has approximately 500 such agricultural power meters installed.

Although, as has already been pointed out, the frequency of lightning storms here on the West Coast is such as to make it difficult to justify general protection from a purely economic standpoint, there is a marked tendency toward the protecting of substations. One of the smaller utilities, located in an area of so little lightning that none of its distribution transformers are protected, makes it a practice to install arresters on its 22-kv. substation busses, and on every 4-kv. feeder. In this case, the expense is considered to be thoroughly justified, from the standpoint of reliability of service.

Another of the smaller utilities, in an area where there is a fair amount of lightning, protects each of its substation circuits of 13.800, 22,000 and 60,000 volts with modern station-type arresters, in order to guarantee continuity of service.

The general practice of the utilities in the southern part of the State is to protect transformer banks in major substations with lightning arresters in areas particularly subject to lightning. Protection of underground cables at their point of contact with overhead circuits is also rather general. In these instances, the matter of cost of possible repair, and continuity of service, appear to greatly outweigh the small loss of revenue resulting from lightning damage.

Power Plants

While the general practice during recent years has been to install lightning arresters at the medium voltage stations, practically none of the 220-kv. plants have arresters. The inherent high impulse strength of lines and transformers for this voltage, combined with a relatively expensive arrester installation and infrequent lightning have seemed to justify such a practice. Isolated instances exist, however, where the installation of 220-kv. arresters is fully warranted, because of the exposed nature of the transmission line in proximity to the station, combined with transformer step-up banks which may be of a reduced insulation level design. Supplementing such protection, would be suitable direct-stroke protection of the station and of the first half mile of the outgoing lines.

Generators

Increasing attention is being paid to the protection of generators and other rotating equipment. Backed up by some nine years of successful experience, the modern scheme of supplementing arresters with protective capacitors between the machine terminals and ground, thereby sloping off the wave-front, is one which cannot be further ignored. The installed expense of such protection for a large generator appears quite insignificant where operating records show that there is any likelihood of a breakdown from lightning.

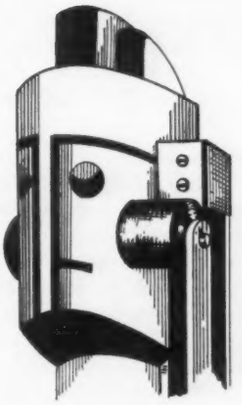
Transmission Circuits

The protection of transmission circuits against lightning presents a subject about which considerable difference of opinion exists. Overhead ground wires, Petersen coils, and protector tubes are the three principal methods. As an example, the various transmission circuits extending from Boulder Dam into southern California all traverse territory having quite similar lightning exposures. Combination overhead ground wires with counterpoise, and overhead ground wires with Petersen coil are used by different utilities. The circuit of one utility has no protection.

The circuit having overhead ground wires and Petersen coil protection has been in service about a year. During its first eight months, it successfully withstood the lightning season with only one outage definitely attributed to lightning and one other to which lightning may have been a contributing factor. On approximately 25 days during this period, lightning storms were experienced.

In contrast to the experience just mentioned, the utility having the unprotected transmission circuit had 38 interruptions during the same period due to lightning. In considering the economics of possible application of lightning protection to this transmission circuit, it must be pointed out that the loss of this source of generation does not seriously handicap the operation of the balance of the transmission system. The loss is immediately made up from other sources, so no interruption to consumers results.

From these data, it is evident that it is not sound policy to protect all equipment from lightning, but that on the other hand it is very desirable to provide protective features in many selected areas, and under certain special operating conditions.



ABC's of Relays

Part 5—High-speed impedance relay typical of fast-acting units

By E. B. KIPP
Westinghouse E & M Co., Los Angeles

MANY of the so-called "slow-speed" relays can be set to operate in a few cycles if necessary but generally speaking, the slow-speed induction disc relay does not lend itself to high-speed operation. The relatively heavy moving element represents considerable inertia which must be overcome before the contacts can close. Since the speed of operation depends to a great extent upon the contact travel (time setting) the operating time can be reduced by setting the contact gap to a fraction of an inch, but good practice dictates that this clearance must never be reduced to the point where the contacts might accidentally close due to vibration originating either externally or internally or to "play" in the bearings and parts.

The simple plunger-type relay is inherently a high-speed (½ to 1 cycle) device and is extensively used where instantaneous operation at over- or under-current or voltage is desired. For example, it is often used in conjunction with slow-speed over-current relays to provide high-speed tripping for short circuits while the slow-speed element protects the equipment against prolonged overloads.

Most of the slow-speed relays have their counterpart in the high-speed design. Thus, there are high-speed over-current, directional, ratio-differential, balance and impedance relays. While the mechanical construction of these relays differs according to the ideas of the manufacturer, they have many characteristics in common and can be typified by the high-speed impedance unit used for transmission line protection.

This relay operates on the same general theory as its slow-speed namesake and in effect measures the electrical distance from the relay location to the fault.

Mechanically, the relay consists of separate first, second and third impedance elements, a synchronous timer and a high-speed directional element. Each of the three impedance elements consists of a balanced beam of silicon steel which is acted upon by current and voltage coils as shown schematically in Fig. 1. The pull of the current coil at the front end is opposed by the pull of the two potential coils on the opposite end of the beam. To produce a steady pull on the beam one of the potential coils is connected in series with a condenser which throws the a.c. magnetic impulses 90° out of phase with those of the other potential coil. The consequent over-lapping of impulses produces a relatively even pull much in the same manner as the new two-lamp fluorescent lighting unit with its auxiliary provides a light free of flicker.

Since the pull of the current coil tending to close the contacts is opposed by the restraining force of the voltage coils, the net force is proportional to the ratio of the voltage to current. At any ratio less than the balancing ratio the contacts will close, and at a greater ratio they will remain open. The electrical balance point of each element can readily be set as required by means of taps in the current coil winding and by an adjustable calibrated core-screw in the current element. The extremely high operating speed of ½ to 1 cycle is obtained through the fine balance and

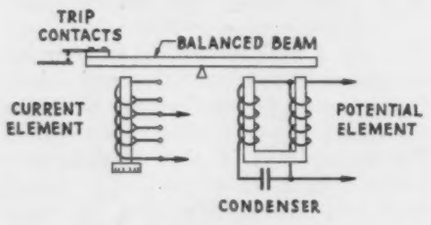


Fig. 1—High-speed impedance relay

light weight of the moving parts and the small (.015-in.) contact spacing.

The contacts of the first impedance element are in series with the directional element contacts so the trip circuit is completed only when the fault current flows in the proper direction. The second impedance element is similar to the first, but its contacts are in series both with the directional contacts and the first set of synchronous-timer contacts so that even with the fault current flowing in the proper direction this element cannot complete the trip circuit until after a short time delay. The third impedance element is similar to the other two except it is equipped with two make and one break contacts. One set of make contacts is in series with the directional contacts and the second set of timer-contacts. The other set of make contacts controls the synchronous timer. The break contact shorts the synchronous timer thus permitting it to reset after the relay has operated.

The synchronous timer consists of a synchronous motor which operates from the main current circuit through a small special current transformer in the relay. The motor is geared to a moving contact which in turn closes two sets of adjustable contacts in sequence—the maximum time setting being about 180 cycles (3 sec.). The first of the adjustable timer contacts is in series with the contacts of the second impedance element and the second in series with the third impedance element contacts as described before.

The directional element is essentially a small rectangular loop of aluminum which is pivoted so that it can rotate through a few degrees to close a set of contacts. A small voltage coil induces a heavy current in the aluminum loop and this current in turn reacts with the magnetic field produced by a current coil to swing the loop in one direction or other depending upon the direction of the flow of power. To all purposes, the action is the same as that of the induction-disc directional relay but the loop element has the advantage of smaller size and higher speed.

From the discussion on impedance relays,* the reader will recall that for any given value of fault current flowing through a line, the voltage drop is proportional to the impedance (distance) to the fault, or voltage equals current times impedance. Likewise for any given impedance the voltage is proportional to the current.

Fig. 2 is a schematic representation of a transmission line with impedance relays located at substations 1, 2, 3 and 4. X represents a short circuit between substations 1 and 2. Thus, if the first impedance elements of the relays at 1 are calibrated so the current-coil pull just balances the voltage-coil pull with a fault at X, the relay contacts will not close. However, if a fault occurs anywhere to the left of X the voltage on the relay coil is reduced proportionally and the current coil pulls the contacts closed. Conversely, if the fault is to the right of X the increased voltage holds the contacts open.

In practice the relays are usually set so the first impedance elements will operate for all faults in Zone 1 (80%

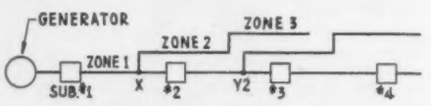


Fig. 2—Schematic transmission line

or 90% of the distance between substations 1 and 2 which is called a "line-section"). The second impedance elements operate for all faults in Zone 1 and 2 (all of the firsts and about 50% of the adjacent line-section). The third elements operate for all faults in Zones 1, 2 and 3. The setting of 80% to 90% of the total line-section for the first element allows for small errors in calculations and relay settings and eliminates the possibility of this element "over-reaching" and operating for faults in the next line-section.

For a fault to the left of X, all three impedance elements in the relays at substation 1 will operate but the first element contacts being directly in the trip-circuit will operate the circuit breaker. For a fault between X and substantion 2 only impedance elements 2 and 3 can operate but the second element will complete the trip circuit first, after a short time delay. The time delay setting must be equal to the operating time of the first impedance elements at substation 2 plus the overall operating time of the associated circuit breaker plus a few cycles leeway.

Thus, for a fault at any point between substation 2 and Y2, the breaker at 2 will always operate first. However, should breaker 2 fail to operate for any reason, then the second or third elements of the relays at 1 will trip breaker 1 after a short time delay. This overlapping of operation is known as "back-up protection."

Because of its selectivity and high operating speed, the high-speed impedance relay finds one of its best applications on loop transmission systems where continuity of service is of prime consideration. Where the ultimate in protection is desired for large systems, the impedance relay can be augmented by carrier-current equipment, the operation of which will be discussed in the concluding article next month.

* Part 4—ELECTRICAL WEST, Nov. 1940.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION

Utilization Data Sheet No. 38

SUBJECT .....COOKING
CUSTOMER .....DEAN CHIP CO.
TYPE OF BUSINESS.....WHOLESALE POTATO CHIPS
SERVICE COMPANY.....WASHINGTON WATER POWER

Prepared by W. K. King and C. L. Hoffman
For the Commercial Section

This equipment, consisting of a steel vat, electrically heated and controlled, replaced two 30-in. round case steel kettles, which were heated by oil. The new vat is 30x60 in. by 18 in. deep, inside insulated on sides and bottom with 3 in. of rockwool. It is equipped with nine 5-kw. G-E immersion units, suitable for use with cooking oil. Heat is controlled by a thermostat set to operate at 325°-375° depending on the type of potato being used.

Operating Data

The electric unit produces 60 lb. of finished potato chips an hour from 200 lb. of potatoes. Consumption amounts to 31.6 kw.-hr. per 100 lb. of potatoes. This compares with 3 gal. of fuel oil previously required.

Advantages

(1) Increased production. The production of finished chips varies from 28 to 35 lb. per 100 lb. of potatoes, as compared with 24-30 lb. by the previous equipment. This increase in weight apparently results from the accuracy of the temperature control, which permits evaporation of the desired minimum of moisture. (2) Improved keeping-quality of the packaged chips. (3) Improved flavor of product. This likewise appears to arise from the accurate temperature control, which permits governing the absorption of cooking oil to assure the most palatable product. (4) Elimination of burning of cooking oil. With the electrical equipment, it has never been necessary to discard any cooking oil, thus effecting a saving of at least 1 lb. of cooking oil per 100 lb. of potatoes. (5) Freedom of chips from carbon deposit—because of sediment well below heaters.

Customer's Conclusion

"While the cost of electric heat is almost 100% greater than that of fuel oil, the advantages indicated above are of sufficient value to offset this added cost and still show a saving over our former method amounting to approximately 28c for each 100 lb. of potatoes fried."

Floods of Daylight for the Pineapple Packers

The Hawaiian Pineapple Co. installs a fluorescent system in its huge cannery

WHEN you pack as many as 4.335,726 cans of pineapple and pineapple juice in a day, you've got to have a real lighting system for your plant. The Hawaiian Pineapple Co., Ltd., growers and packers of Dole Hawaiian pineapple products, have set such a record and in their Honolulu cannery, they've installed a system of fluorescent lighting that is the largest in the Territory of Hawaii and one of the largest in the United States.

Simulated daylight now floods every corner of the 500 by 50 ft. preparation department in the cannery. Fluorescent lights have also been installed in the syruping and double-seaming departments. The new system is composed of 576 Benjamin "Stream Liter" 2-tube units.

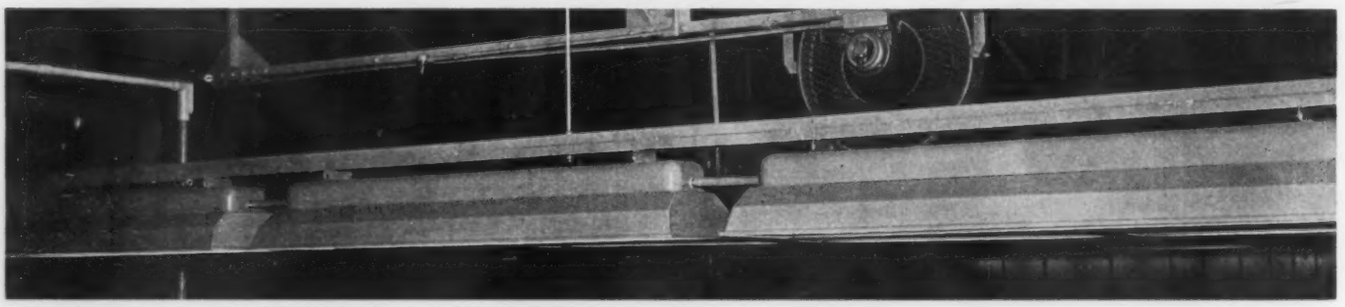
During the industry's peak season, a total of 5,000 men and women work on three shifts in the preparation department. There they grade pineapple slices and special cuts, secure uniformity of color and texture, and perfection in general. Careful trimming of fruit is necessary to remove any bits of shell that may remain after the outer covering of the fruit has been removed.

Harry D. Jefferson, chief electrician for the plant, found out that one problem was to arrange the fixtures in order to get uniform maximum light without shadows and with only a minimum of heat. Experiments were made under actual working conditions before the final locations of the fixtures were decided.

Some lights were placed over the employees' heads, and others at their backs. The fixtures were arranged in lines 11 ft. 7 in. above the floor, with 6 inches of space between the ends of the units. Over the trimming tables, these lines are 10 feet apart. Over the packing tables, a distance of 20 feet separates the lines, for the reason that packing operators, in contrast to trimmers, work on one side of their tables only.

Transition from daylight through twilight to darkness passes without cannery employees being aware of the change. Illumination under the old system produced glare from shining cans and from the stainless steel table tops. Fluorescent lights have eliminated this evil.

The new fixtures are mounted lower than the old incandescent lamps. There are now 35 ft.-candles of light on the trimming tables as against 6 ft.-candles with the old system. Lighting over the packing tables has been increased from 6 ft.-candles to 20 ft.-candles with fluorescent lights. The 20 ft.-candles represents the lumens produced by the fluorescent lights at the halfway point in their life, at a maintenance factor of 85 per cent.



Another advantage of the new system is the decreased amount of heat given off per lumen. Five hundred and seventy-six 100-watt fluorescent lights have replaced 245 500-watt glassteel diffusers. This has cut the kw.-load from 122.5 for the incandescents to 57.6 for the fluorescents. Of this 57.6 kw., only 43 per cent, or 33 kw., is radiated heat. Balance of the heat is dissipated by connection or induction to the surrounding air or fixture parts and is lost upward through the ventilation monitor. With the incandescent system, there was about 95.5 kw. of radiated heat.

By furnishing illumination of unchanging color day and night, fluorescent lighting is a boon to these packers and trimmers in their skilled work of turning out superior quality products.

Method of mounting new fluorescent lights in the Hawaiian Pineapple Co.'s Honolulu cannery is shown above. Two 20 in. by 50 ft. channels are welded together flange to flange. These were supported at ends and at three other mid-points by iron rods. Clips were welded to the beams to which the fixtures were bolted. Below is a general view of the installation in the preparation department where eyestrain has been eliminated

Circuit Idea Cuts Cords

QUITE confusing and cumbersome is the present code system of residential branch circuit calculation, G. E. Price, Orange County, electrical inspector, told the annual meeting of the Southwestern Section, International Assn. of Electrical Inspectors. Therefore inspectors in Orange county have developed a system they use in preference. It simplifies the calculation of the number of circuits required and allows a leeway for additional outlets if wanted without overloading the circuits.

Price found that electricians were avoiding the calculation of circuits according to the code system. Further experience indicated that the actual residential lighting and plug circuit loads were a direct function of area, special loads such as space heaters, water heaters, ranges, excepted.

Recording Wattmeter analyses of a representative cross section of residences showed that the accepted code calculations with demand factors generally insure reasonable adequacy. However, a great deal of cord wiring trouble was found after installation with subsequent circuit cutout tampering.

Too keen competition, together with the code's bulky calculation requirements were felt to be principally responsible.

"The following hypothetical illustration serves to clarify," explained Price. "Suppose electrician, Mr. 'A' bid on a small, popularly priced $2,500 to $3,000 home. Such a building would represent perhaps from 900 to 1,000 sq. ft. of area. Suppose the plans indicated 10 lights and 16 plugs. The lights could, of course, be wired on one circuit. The 16 plugs would just fill two circuits. Hence, Mr. 'A', in view of severe competition, would probably bid on the basis of a three-circuit fuse cabinet. Very frequently the owner's wife desires several additional outlets after the rough wiring is installed. The electrical contractor in this case is rather on the spot. If he installs the extra outlets, another circuit will be required and it is exceedingly difficult to justify the *apparent* high per outlet cost for the extras, particularly in view of the original low per-outlet bid. As a result the usual recourse for Mr. 'A' is to convince the owner that she does not need the extra outlets. Net result: a very bewildered homeowner and a subsequent maze of cord extensions."

The electrical inspector's fundamental job is that of protection of life and property. With that charge and the foregoing problem in view, the electricians of Orange County assisted in the preparation of a simplified and workable scheme for calculating circuits and for inviting adequate outlets. The method, briefly, is as follows: No particular trouble has been experienced with lighting circuits and therefore they have not been changed from the usual maximum of 12 lights on a No. 14 circuit.

The minimum number of circuits, both lights and plugs required in a single family or duplex residence, are fixed on the basis of one circuit for each 300 sq. ft. of story plan area.

The plug circuits are No. 12 wire and limited to 8 outlets for any one circuit, except that *any* number of outlets may be installed on a circuit provided that the circuit is confined within 300 sq. ft. of story area and further provided that the circuit is protected with a suitable approved non-tamperable cutout.

The service calculation is correspondingly simple. Circuits up to and including five in number may be installed on a 30-amp. service. For larger services 30 amps. of required service capacity are added for each additional five circuits or major fraction.

Small appliance transformers (bell, furnace, chime, etc.) of not more than 150 watts each, are installed each on a separate circuit without entering into the above calculations.

All special loads, such as space heaters, water heaters, ranges, etc., are treated as extra loads to the above service calculations.

It is significant that no mention is made of demand factor or additional load requirement for small appliances and it should be further noted that on the usual basis of 2 watts per sq. ft. the new circuit requirement is really 600 watts. However, the failure to mention the foregoing in connection with any of the calculations was quite intentional in order to eliminate unnecessary bulk.

The scheme has been in experimental use in Orange County for some little time and is now written specifically into the ordinance. The electricians are generally enthusiastic and find that every job is a potential sale for extra outlets. Owners have been very quick to grasp at the apparent "concession" and cord extensions in those homes are conspicuous in their absence.

● THE CITY OF OAKLAND has such a new ordinance incorporating the 1940 N.E. Code, according to Ben C. Hill, superintendent of the Electrical Division. The Oakland ordinance, according to Hill, will contain a minimum of local rulings in addition to the Code, mostly defining special requirements within certain fire zones.

Sight Questions

Questions about lighting and seeing asked of the Sight Conservation Council of California and published in ELECTRICAL WEST, Nov. 1939 (p. 44, 45), are still in preparation by the Council and cannot be released until the experts are satisfied with the answers. To members of the electrical industry interested in an answer to any of the questions given, Clark Baker, secretary, 447 Sutter St., San Francisco, has offered to write and supply the answer as it is available.

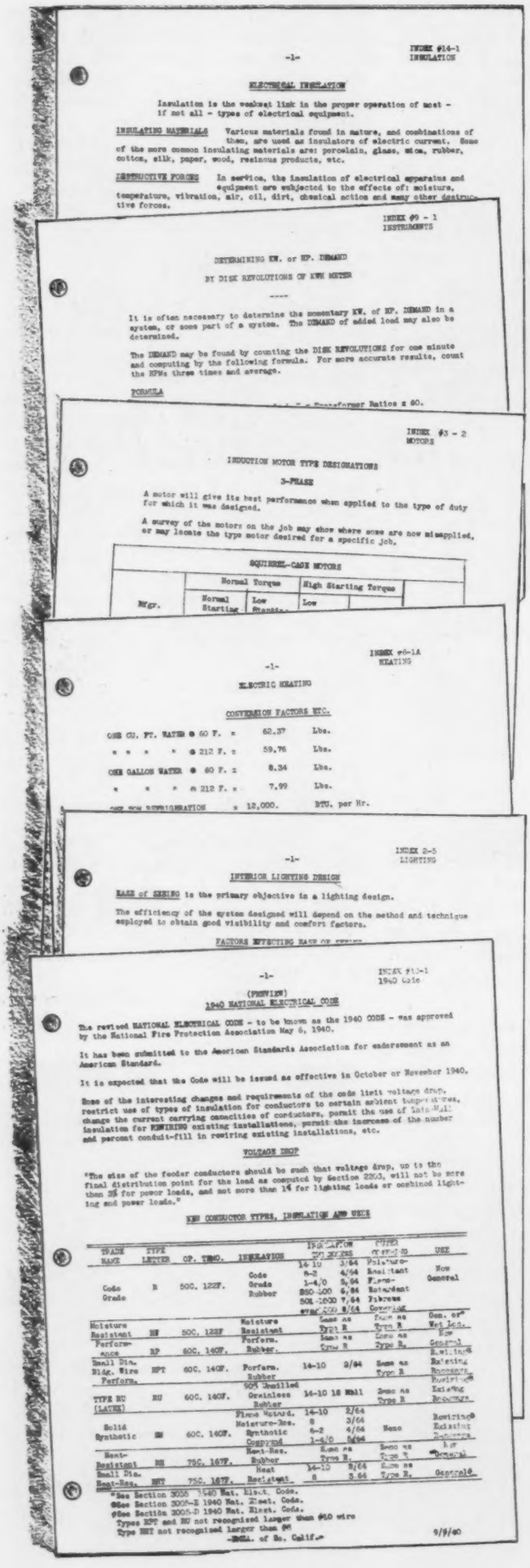
The problem facing the committee has been that many of the questions have been so broad as to make a definite answer impossible without qualification. The committee is revising and editing in order to cover all phases of the question itself.

Wire Rule

A pocket-size wire calculator called the Wirometer is a handy gadget offered the trade for computing wiring problems in accordance with the 1940 National Electrical Code by General Electric Appliance & Merchandising Dept., Bridgeport, Conn.

Made of 2 sliding celluloid covers with 6 interchangeable cardboard slides,

the user may calculate quickly conduit fill, wire sizes, current carrying capacities when more than 3 wires are run in a conduit, corrections in capacities for ambient temperature and for voltage drop. Wire sizes range from No. 16 to No. 4-0 with distances from 10 to 1,000 ft. Even the various new types of building wires are included with a slide for quick calculation of their use.



-1- INDEX #14-1 INSULATION

ELECTRICAL INSULATION

Insulation is the weakest link in the proper operation of most - if not all - types of electrical equipment.

INSULATING MATERIALS Various materials found in nature, and combinations of them, are used as insulators of electric current. Some of the more common insulating materials are: porcelain, glass, mica, rubber, cotton, silk, paper, wood, resinous products, etc.

DESTRUCTIVE FORCES In service, the insulation of electrical apparatus and equipment are subjected to the effects of: moisture, temperature, vibration, air, oil, dirt, chemical action and many other destructive forces.

INDEX #9 - 1 INSTRUMENTS

DETERMINING KW. or HP. DEMAND

BY DISK REVOLUTIONS OF KWH METER

It is often necessary to determine the momentary KW. of HP. DEMAND in a system, or some part of a system. The DEMAND of added load may also be determined.

The DEMAND may be found by counting the DISK REVOLUTIONS for one minute and computing by the following formula. For more accurate results, count the RPMs three times and average.

FORMULA

INDEX #3 - 2 MOTORS

INDUCTION MOTOR TYPE DESIGNATIONS

3-PHASE

A motor will give its best performance when applied to the type of duty for which it was designed.

A survey of the motors on the job may show where some are now misapplied, or may locate the type motor desired for a specific job.

SQUIRREL-CAGE MOTORS

Mfgr.	Normal Torque		High Starting Torque	
	Normal Starting	Low Starting	Low	

INDEX #6-1A HEATING

-1-

ELECTRIC HEATING

CONVERSION FACTORS ETC.

ONE CU. FT. WATER @ 60 F.	=	62.37	Lbs.
" " " @ 212 F.	=	59.76	Lbs.
ONE GALLON WATER @ 60 F.	=	8.34	Lbs.
" " " @ 212 F.	=	7.99	Lbs.
ONE TON REFRIGERATION	=	12,000.	BTU. per Hr.

INDEX 2-5 LIGHTING

-1-

INTERIOR LIGHTING DESIGN

EASE of SEEING is the primary objective in a lighting design.

The efficiency of the system designed will depend on the method and technique employed to obtain good visibility and comfort factors.

FACTORS AFFECTING EASE OF SEEING

-1- INDEX #13-1 1940 Code

(PREVIEW)

1940 NATIONAL ELECTRICAL CODE

The revised NATIONAL ELECTRICAL CODE - to be known as the 1940 CODE - was approved by the National Fire Protection Association May 6, 1940.

It has been submitted to the American Standards Association for endorsement as an American Standard.

It is expected that the Code will be issued as effective in October or November 1940.

Some of the interesting changes and requirements of the code limit voltage drop, restrict use of types of insulation for conductors to certain ambient temperatures, change the current carrying capacities of conductors, permit the use of Code-Mill insulation for REWIRING existing installations, permit the increase of the number and percent conduit-fill in rewiring existing installations, etc.

VOLTAGE DROP

"The size of the feeder conductors should be such that voltage drop, up to the final distribution point for the load as computed by Section 220-3, will not be more than 2% for power loads, and not more than 1% for lighting loads or combined lighting and power loads."

KEY CONDUCTOR TYPES, INSULATION AND USES

TRADE NAME	TYPE LETTER	OP. TEMP.	INSULATION	INSULATION THICKNESS	TYPES OF BRAID	USE
Code Grade	R	50C. 122F.	Code Grade Rubber	14-10 3/64 8-2 4/64 1-4/0 5/64 250-500 6/64 501-1000 7/64 over 1000 8/64	Paper-Asbestos Resistant Flame-Retardant Fibrous Covering	Gen. or Wet Loc.
Moisture Resistant	MR	50C. 122F	Moisture Resistant	Same as Type R	Same as Type R	Gen. or Wet Loc.
Performance	RP	60C. 140F.	Perform. Rubber	Same as Type R	Same as Type R	Gen'l Purpose
Small Dia. Bldg. Wire Perform.	SPT	60C. 140F.	Perform. Rubber	14-10 2/64	Same as Type R	Existing Recovers Restrict
TYPE RU (LATEX)	RU	60C. 140F.	30% Unrolled Grainless Rubber	14-10 2/64 8 3/64	Same as Type R	Existing Recovers
Solid Synthetic	SN	60C. 140F.	Flame Retard. Moisture-Res. Synthetic Compound	14-10 2/64 8 3/64 6-2 4/64 1-4/0 5/64	None	Rewiring Existing Restrict to Dry
Heat-Resistant Small Dia. Heat-Res.	RH HRT	75C. 167F. 75C. 167F.	Heat-Res. Rubber Heat Resistant	Same as Type R 14-10 2/64 8 3/64	Same as Type R Same as Type R,	General Controls

*See Section 3035 1940 Nat. Elect. Code.
**See Section 3005-E 1940 Nat. Elect. Code.
@See Section 3005-D 1940 Nat. Elect. Code.
Types RPT and RU not recognized larger than #10 wire
Type HRT not recognized larger than #8

-EMEA. of So. Calif.

9/9/40

Howard C. Park, at right, maintenance engineer for General Motors plant, chairman of the data committee which compiles the "dope sheets". Collecting data of this type has long been his hobby

Typical of the sheets issued are those illustrated at the left. Each subject has an index number and sheets are designed to go in a loose leaf binder for efficient ready reference

Data for the E. M. E.

Condensed "dope" sheets compiled by Electrical Maintenance Engineers of Southern California for its members

ELECTRICAL maintenance, declares the Electrical Maintenance Engineers Assn. of Southern California at the introduction to a new educational course, is the art of maintaining a balance or ratio between parts and functions of the equipment and built into it by the designer and manufacturer. Any deviation from this balance will show in impaired service and efficiency.

A thorough understanding of the basic principles, both mechanical and electrical and their relation to each other is necessary to service it properly. The underlying idea in both the educational courses which this association sponsors and in the data sheets which its committee, chairmaned by Howard C. Park, General Motor plant maintenance engineer, Los Angeles, furnishes to members is the same.

"It is not to make designing engineers," says Park, "but to give the maintenance man a clear understanding of *why* definite amounts of materials, certain characteristics, definite air gaps, clearances and shapes were used by the designer to obtain the performance and efficiency expected from the equipment. Without such knowledge, servicing and maintenance reduces itself to waiting for a breakdown to occur.

"When it does, too often parts are replaced with little or no thought as to the cause of the trouble or of its remedy. With such knowledge the maintenance man is able to anticipate the trouble before a breakdown actually occurs. His training causes him to recognize any disturbance in the functions of the equipment and thereby eliminates costly shutdowns with their accompanying loss of production."

With the permission of the executive committee of the EMEA of So. Calif., ELECTRICAL WEST hopes to print many of these data sheets in full for the similar guidance of maintenance engineers throughout the West. Despite the demise of Electrical Development League, which assisted it, the EMEA will continue to carry on with its meetings and program, using as its new headquarters the Electric Club's room at 803-816 W. 5th Street, Los Angeles, according to Glen Woods, president.

Flourescent Light Draws the Cars at Hotel Utah

IMPRESSIVE in its quiet and unpretentious dignity, the recently completed parking garage of the Hotel Utah in Salt Lake City represents the utmost in functional design in architecture and engineering.

This completely modern structure was built adjoining the hotel and although it occupies an area of only 63 by 72 ft. above the ground level, it provides storage space for 250 automobiles on two floors, each 144 ft. sq., underground; while the structural design provides for future extension upward to the present ten story height of the hotel. With the exception of the ground floor area and a paved driveway leading to the street, the entire roof of the garage at the street level is covered with two ft. of earth fill and attractively landscaped with lawns and shrubbery. The ground floor is occupied by the manager's office, filling station area, wash room, grease room, elevators, and a 15 ft. turn-table to facilitate the rapid and efficient handling of cars.

A portion of the ground floor reception and service area where a daylight quality of 30 ft.-candles intensity is provided by luminaires

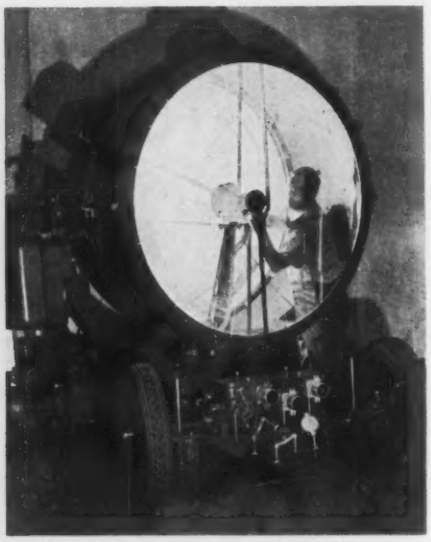
The necessity for space-consuming ramps is eliminated by the use of two 13 by 21 ft. automatic elevators each of which is designed to raise or lower a car at the rate of 80 ft. per minute and is powered by a 25 hp. induction motor. Provision was also made in the design of the elevators for raising cars to the roof of the ground floor area from where they can be moved to adjoining convention rooms on the mezzanine floor of the hotel. Ventilation for the underground floors is provided by means of ten ½ hp. combination heating and ventilating units and one 25 hp. exhaust fan, which combination supplies fresh air at the rate of 43,000 cu. ft. per min. Drainage is provided by means of a complete system of drains and pumping facilities to raise accumulations 15 ft. to the sewer level.

Shielded fluorescent fixtures mounted directly on the ceiling and each employing two 48 in. daylight lamps provide an attractive level of illumination of 30 ft.-candles on the ground floor. The wash room is lighted by four vapor-proof RLM fluorescent reflector units so installed as to provide adequate illumination on the vertical surfaces of cars serviced. Each of these units employs two 48 in. daylight fluorescent lamps, and the resultant level of illumination on a car in place varies from 35 to 45 ft.-candles. In the storage areas on the basement and sub-basement floors, daylight fluorescent lamps provide an intensity of 10 ft.-candles in the aisles, while the storage-stall areas are lighted to 5 ft.-candles by daylight incandescent lamps in RLM Dome reflectors. Two 1500-watt-flood lights mounted on the wall of the adjoining hotel provide a flood-lighting job that is effective even though it is located on an otherwise brightly lighted street.

The electrical system for the building is fed from a master service and switchboard in the hotel by means of a 750,000 C.M. circuit for power and a 250,000 C.M. circuit for lighting. All switchboards and panelboards are of the circuit breaker type employing the highest quality circuit breakers for all swicthing and circuit protective units, and the entire installation was designed for efficiency and long life.

E. E. Oberg was the electrical contractor on the job and George C. Young of Salt Lake City was the architect.

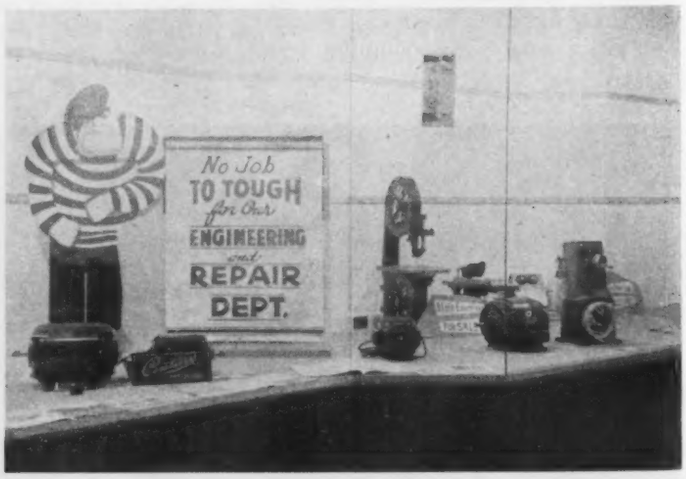
Exterior and approach to the Hotel Utah parking garage on a busy night. Two 1500-watt Benjamin "Ellipto-lite" flood lights flood the approach as well as the front of the building. Adequate well-diffused illumination is provided in the washroom by four Benjamin vapor-proof RLM units



One of the new 800,000,000 candle-power searchlights being made by General Electric for home defense purposes for use by the U. S. Army. This light is so powerful that in tests it was possible to read a newspaper easily at night in an airplane flying at a distance of 12 mi. from Schenectady. An engineer here adjusts a carbon in the giant light

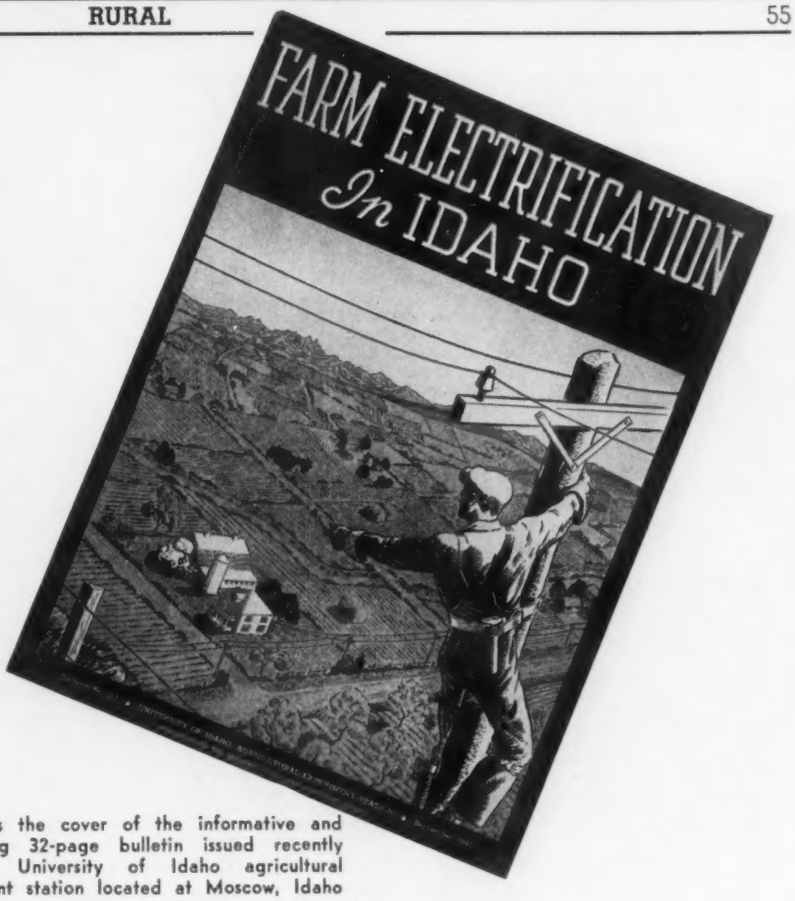
Light and Wire in Picture

LESS GLARE comes to the playing field from the stippled lens 1500-watt Alzac Westinghouse reflectors at the James Rolph playground in San Francisco (see ELECTRICAL WEST, Oct., 1940, p. 45) pictured above. It has become the night spot for youth of the Potrero district, an important social benefit. Below, at left, the novel upended glass roofed demonstration home to picture adequate wiring to the throngs at Los Angeles County Fair, at Pomona, Calif. Southern California Edison devised this to show the contrast between 1900—one lighting circuit per room—1920—one convenience outlet—to 1940 wiring for full electric utilization. Tiny lamps and appliances to scale were in the model, wiring was small copper tubing. At the right is shown a demonstration board developed by G. H. Bliesner, of Bonneville Administration, to teach farm groups the safe carrying capacity of wires. With resistance to equal a 300-ft. circuit he could demonstrate voltage drop. Below, at right, is how ingenious Frank Andrews Motor and Magneto Works of Modesto takes over adjacent vacant store windows for display of his equipment and services, adapting manufacturer sales—help materials to fit new themes where necessary. The town looks better for it, Andrews exposes his merchandise to more people—it is a good all around community job.



State with a Rural Electric Record

Idaho surpasses most states in use of rural electricity with over half of farms with service and vast fields awaiting day of irrigation



Above is the cover of the informative and interesting 32-page bulletin issued recently by the University of Idaho agricultural experiment station located at Moscow, Idaho

SPARSELY settled Idaho has a record for farm electrification surpassed by few states, and its progress in line extensions and rural use of electricity dates back to the early 1900's.

Today 64 per cent of all occupied Idaho farms have electric service, as compared with the national average of 27.8 per cent. Eighty-seven per cent of Idaho farms with dwellings valued at more than $500 now have electricity, an accomplishment which ranks fourth among the states.

Most of the farms not served with electricity are isolated from each other and scattered throughout the smaller valleys in the dry farming and mountainous areas.

Not only is Idaho's achievement remarkable from the standpoint of widespread electric service facilities among farms, but the kilowatt hour use by these farms is twice the national average for domestic service. This shows the degree of acceptance for labor-saving electric appliances in progressive farm communities.

Farm electrification in Idaho had its beginnings in the early 1900's, when some rural "services" were installed as a result of line extensions to mills, mines, pumping plants and interurban transportation systems. This was the era of rapid increases in population, the founding of towns and communities, and the planning of vast irrigation projects. By 1910 the progressive electric utilities had established the policy of building distribution lines to serve irrigated farms in southern Idaho, and short extensions reached at least 100 farms in northern Idaho.

It is interesting to note that the late, great electrical wizard, Charles P. Steinmetz, made an early contribution to farm electrification in Idaho when he supervised the construction of America's first 60,000-volt line from Post Falls to Coeur d'Alene, Idaho, in 1903. From this line a number of rural extensions sprouted. Steinmetz's original computations are in the files of the Washington Water Power Co.

Idaho's extensive farm electrification was made possible by the coordinated development of irrigation and hydro-electric power. From the beginning the objective has been to get low cost water on the land and also to provide widespread electric service to the farms. Future expansion of irrigation facilities involves the multiple use of water, with the cost of water storage divided between irrigation, flood control and hydro-electric power development.

To date the hydro-electric power development in the state has kept pace with industry and agriculture. Although it has reached the total of 287,353 kw., this figure represents only about one-eighth to one-tenth of the estimated potential horsepower available from Idaho streams.

The generating capacity of 76 hydro-electric plants in Idaho totals 387,927 hp., which fully meets the present needs for power. According to estimates of the U. S. Department of the Interior, Idaho has 2,706,000 undeveloped hp. available 90 per cent of the time.

With this vast power reserve and at least a million acres of fertile lands awaiting irrigation, Idaho should never be dependent upon hydro-electric power produced in neighboring states.

For the past 15 years, the Idaho committee on the relation of electricity to agriculture has carried on active projects in research and educational work in cooperation with the agricultural experiment station of the Univ. of Idaho. It is estimated that the committee has been in contact with approximately 95 per cent of the electrified farms in Idaho. Through the cooperation of the department of agricultural engineering, demonstrations and meetings have been held which have contributed to solving specific problems of individual farmers.

Since 1938 the committee has been active in the field of education and extension in addition to the research program. This has resulted in the preparation of a colored motion picture sound film showing a number of the activities in rural electrification in the various departments of the college of agriculture and the agricultural experiment station. Also a number of film strips have been prepared on electric hotbeds, feed grinding, water supply and other applications of electricity to agriculture. Three rural electrification short courses have been held at the University of Idaho, providing a week's instruction to rural service men from the utilities and others interested in the research and educational program sponsored by the committee.

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Northwest's Power Future

SINCE 1932 there hasn't been an election in the Pacific Northwest but what has had ample significance to the power industry, and the 1940 balloting was no exception. The PUD promoters put public power before the electorate in 21 districts—in some for the third time. On the basis of over-all returns in the 21 separate elections in Oregon and Washington, the people turned thumbs down by a substantial majority—5,000 in Oregon and 15,000 in Washington. Unfortunately however, the balloting was not decided that way. In 11 Oregon districts, five were voted favorably and six were turned down, although these latter represented but 28 per cent of the area in which district formation had been sought. In Washington, elections were held in 10 county-wide districts; four passed and six failed. Of the 39 counties in that state 29 now are organized into PUD's.

Notable aspects of the 1940 elections were the voting of PUD's in two key spots—Yakima County in central Washington which had defeated the proposal in three previous elections, and a large district in central Oregon. Equally notable and considerably brighter was the defeat of PUD proposals in the populous central Willamette Valley and Coos Bay areas in Oregon and Spokane County in Washington.

Although the people continue to turn down the majority of these PUD measures, nevertheless in each succeeding election a few more are formed, which means a gradual extension of public ownership territory. The irony of the situation is that what started out innocently enough as a simple procedure to let the people of any district decide how they wanted their power business conducted—by private enterprise or as a publicly operated system—has developed into an insidious scheme of the power bloc in the federal administration to socialize the entire power industry of the Pacific Northwest.

HR 10586, the Columbia Power Administration Act, will pave the way for this scheme. The bill now before Congress sets up a dictatorial organization, responsible only to the Secretary of the Interior, implemented with a $200,000,000 revolving fund which may be used for the outright purchase of any private utility in the Northwest. Parts of systems so purchased may be parceled out to PUD's; the balance retained by CPA. Under the terms of the act as written, CPA would have broad powers of condemnation of the kind that would permit immediate taking over of property with details of payment worked out later. CPA would have extensive control over rates and service. It would also have the financial backing of the U. S. Treasury.

If HR 10586 passes in its present form, the PUD's and municipalities that have been lured into public ownership by promises of benefits from "cheap" Bonneville and Grand Coulee power will be in for a rude awakening. Home rule will be out and what the local folks thought would be their own autonomous public power setup will simply be a creature of a vast federal power regime. Many a citizen who voted for his PUD in the belief that local people would run it, will suddenly wake up too late to the realization that he has bargained away a great progressive, tax-paying private industry for a bureaucratic, autocratic, politically-minded power operation having no responsibility whatever to the local customer. Every decision of consequence would be made 3,000 miles away in Washington, while local executives and employees would simply be rubber-stamps putting into effect whatever policies the Secretary of the Interior dictated. It is up to the utility industry all over the country to be alive to the danger in this legislation, for if it passes and is put into effect in the Northwest, it will inevitably spread to other areas and a long step will have been taken toward the socialization of the entire industry in the United States.

An Ounce of Prevention

JUST a few weeks ago some of the 11-kv. cables serving Mare Island Navy Yard were sabotaged. The papers are reporting recurrent explosions in industrial plants. Charges of potential fifth column activities are rife. Consequently the following extracts from a letter from J. Edgar Hoover, director of FBI, to the editors are relevant:

In the war-torn world of today America must strengthen her internal and external fortifications if she is to survive the menace of totalitarianism. The protection of our industrial facilities to insure the uninterrupted production of goods and material is essential to our national defense. Based upon this premise the FBI in September of 1939, in accordance with the request of the War and Navy departments, inaugurated a program to survey the protective facilities of manufacturing establishments having large contracts to provide the government with defense materials. The purpose of the surveys is to submit recommendations to bolster the physical protective facilities of the manufacturing plants for the prevention of sabotage and espionage activities.

The first and final responsibility to give speed and strength to our national defense program by protection against espionage and sabotage lies with industry itself. Only through the energy and alertness of its officials and workers will the full measure of preparedness be attained.

In line with this plant survey program and to assist industrial concerns and municipalities in establishing effective protection against possibilities of acts of espionage and sabotage the FBI prepared a comprehensive booklet entitled "Protection of Industrial Facilities." Because of its confidential nature this booklet is limited in distribution to heads of duly constituted law enforcement agencies and executive officials of industrial concerns manufacturing defense materials under government contracts.

Having emphasized before in these columns the importance of an adequate and continuous supply of electric power to the defense program, we can only repeat that utilities and industrials here in the West should avail themselves of the information collected by FBI and offered by Hoover.

PCEA Pitches In

FEW outside of the officers and members of the guidance committees, unless it be those who have served in these capacities previously, comprehend the sweep of activity encompassed by the Pacific Coast Electrical Assn. It takes a detached observer, perhaps, viewing from a perspective of visit to many sessions all going on at once, to appreciate the scope and at the same time the depth of penetration of its committee and study group activity.

Two conclaves, each of a crowded day and a half, have just been completed at Oakland and Pasadena. Out of these discussions groups will emerge programs, compilations of data, sales and promotional material, factual reports, standardization of materials and methods where such will result in savings and superior service. Where no tangible report or program emerges, the frank discussion at least will tend to unify thinking, to bring appreciation of the views and needs of others involved in the industry to each one who participated.

Here was true democracy at work. Not theoretical, visionary mouthing, but real stuff, participated in by real men and women earnest in advancing a business and a technology of which they are proud. Social benefit? Certainly. It all adds up to social benefit in the end because it is practical, realistic, sound.

Mutual Interests

LOST somewhere in the tide of social consciousness that is sweeping the country is the appreciation of the complex relationship that exists between business and the individual employee. Certainly in the welter of governmental paternalism for the working man, sight has been lost of the one fundamental fact that counts—that only as business succeeds and profits can the individual worker earn more or work fewer hours. In many instances politically engendered antagonism or at least suspicion is working against the creation of any mutual respect and confidence between business and labor. If this continues, then the likelihood of any real industrial stability remains remote.

There is a real industrial relations problem ahead for business in the re-creation of mutual understanding of the economic relationship surrounding the welfare of business and the welfare of the worker. The task today is complicated by legislative restrictions, higher tax levies and the intensity of the defense program. But the need is as great as any public relations requirement that business and industry ever faced. It is something on which a start should be made now.

WHEN you buy for price these days, you can never be sure. It's unwise to pay too much, but it's worse to pay too little. When you pay too much, you lose a little money—that is all. But when you pay too little, you sometimes lose everything, because the thing you bought was incapable of doing the thing it was bought to do.

The common law of business balance prohibits paying a little and getting a lot—it can't be done. If you deal with the lowest bidder, it is well to add something for the risk you run. And if you do that, you will have enough to pay for something better—by John Ruskin.

(Contributed by Harry L. Gerster, General Electric Supply Corp., Seattle, Wash.)

PCEA Goes

North and South con- under way with reports,

At the Thursday luncheon in Pasadena are George Bigelow, Nev.-Cal. Electric; Harry Harper, Graybar; past president W. L. Frost, retired, and PCEA president Clyde Houston

ALL WORK and no play did not make the electrical industry dull, at least not at either the Oakland conclave, Nov. 7-8, or the Pasadena one, Nov. 14-15, launching the year's serious activities of the Pacific Coast Electrical Assn. From the moment President Clyde Houston, Southern California Edison Co., opened the first general session tersely, good naturedly, but with a serious look out of the twinkle in his eye, it was business throughout.

Attendance was thoroughly representative of all branches and all regions of (PCEA) territory. According to Victor W. Hartley, managing director, it topped 350 in Oakland, 550 in Pasadena. Soon broken up into committee study sessions, these parallel meetings were well attended, discussion was free and frank.

Noon luncheons brought the entire group together for inspiration and still more knowledge. Speaker on the Thursday luncheon in Oakland was Dwayne Orton, president of Stockton Junior College; at Pasadena, James Mussatti, general manager, California State Chamber of Commerce. Both assured the industry that despite the election, the American way of life can and must be kept alive.

"If our American democracy is to be saved we must keep the inner shrine of our democratic way of life," said Orton. "That is, our historic individualism must be kept alive."

In developing the theme Orton called attention to the need of placing various aspects of American life in harmonious balance. Taking a scene from the film, "Edison the Man" as his theme, he told of Edison pointing to two dynamos and from them illustrating that just as they must be kept in balance the two dynamos of American life must be kept in balance—the dynamo of man's God-given ingenuity, and the dynamo of his God-given humanity.

Mussatti, in a dramatically patriotic speech, recalled the history of the revolt of American colonists from feudal and merchantilist domination of old Europe, of America's growth under capitalism, and led up to present dangers to the country, internally as well as externally. He ended by pleading for preservation of our system of government and of free enterprise.

New program technique in presenting a subject were the panel discussions of "How to Develop a Public Relations Consciousness Throughout an Organization" staged by the Administrative Services Section at Friday's luncheons, at both conclaves.

Defining public relations as "reputation or personality—the ability to win and maintain public respect, admiration," moderator George Tenney set up the thesis that the term "public" today might mean customers or consumers, employees, voters, related businesses or governmental agencies. He pointed out that good public relations could include such a multiplicity of things as goodwill building, sales policy, credit policy, claim adjustment, employee relations, institutional advertising, fair prices, good service, honorable dealing, good business ethics, and civic attitude.

In the open discussion that followed both Roth and Eliel drew attention to the increasing importance of employee relations and discussed approaches to this vital problem. Roth pointed to the growing need for developing a mutuality of interest between employee and business; that unless the employee group which today looks to government as its benefactor is made to realize that it will only prosper as business prospers, the future will be dark. Eliel told how this was being done in some organizations.

In discussing the consumer movement Doe pointed to some of the good that has resulted from soliciting advice from informal boards of directors made up of consumers. He told how Safeway makes its stores integral parts of local communities. Both he and Balzari emphasized that institutional advertising was meaningless in winning public acceptance unless policies and practices were right. Fisher declared that a public relations program should consist of a lot more than mere "trouble-shooting"; that it was something that had to be lived by every member of an organization from the top down. Dostal defended business against the charges that "bigness is synonymous with badness" by pointing to the achievements of large corporations in improving the standard of living, by reducing prices and by increasing efficiency. He urged that the public be shown some of the advantages and results of research.

At a similar panel in Pasadena, the moderator was S. E. Gates.

In similar general terms Paul Armstrong laid the foundation for the ques-

At left, Paul Thompson, PG and E; L. C. Rausch, Coast Counties, and Ray Piercy, PG and E, who were prominent in the Customer Relations Group at Oakland. In the right picture, R. C. McFadden, Southern California Edison; Frank Hansen, Western Institute of Light, and W. H. Robinson, Jr., G-E Lamp, discuss a pertinent point at the Southern Conclave

To Work

claves get year's activity discussions and panels

With George Tenney, editor, ELECTRICAL WEST, as moderator, the Oakland panel consisted of this group of San Francisco business men and leaders. Left to right, they are R. E. Fisher, vice-president, PG and E; Almon E. Roth, president, San Francisco Employers' Council; George Tenney; R. A. Balzari, sales counselor; Paul Eliel, Stanford Graduate School of Business Administration; Charles A. Dostal, Pacific Coast mgr., Westinghouse; Rilea Doe, public relations, Safeway Stores

tion and answer forum which followed. Metzler told interesting details of the lengths to which the moving picture industry goes to keep working conditions harmonious and to build a family spirit. Despite this, he admitted, strikes are frequent, but once settled, mutual good feelings continue. Thurston Ross answered one question to the effect that the majority of workers like to take pride in their work and that despite Labor Board rulings, welcome facts about the company and the work in which they are engaged.

DeLong spoke of the need of constant survey of customer response to the company and its products. Case maintained that mere advertising of public relations would not sell it to employee or public if performance did not live up to promise.

Operating Economics Section

Biggest, most well-attended meetings of the Operating Economics Section, of which G. E. Bishop, Coast Counties Gas & Electric Co., is chairman, were those of the transmission, distribution and sub-station group. Bishop arranged the program of this Section with as little formality as possible, in order to steer the meetings away from prepared papers and toward informal discussions.

This was especially true with both the steam and hydro groups, at both northern and southern meetings, where not even general topics were designated, but simply round table discussions of whatever questions or experience the group members wished to bring forth. Discussion leaders in the North were V. F. Estcourt, steam group, and G. H. Bragg, hydro group; in the South were H. A. Noble, steam group, and J. C. Gaylord, hydro group.

The transmission, distribution and substation group followed the same program at both northern and southern conclaves, opening with a discussion of two-way radio communication. PG and E engineers described the development of top-loaded antennas for their patrol cars, which have increased the current at the end of the antenna thus improving audibility. Practical details of the design were discussed. PG and E reported it is having success at fixed stations with horizontal antennas a half wave-length long. Interest in the possibilities of frequency-modulated equipment was keen.

Discussion of automatic reclosing of oil circuit breakers revealed a general trend toward a reduction in the number of shots and in the interval between shots. The importance of the question by reason of conversion of more plants and substations to automatic operation was mentioned, and it was felt that a better correlation of data would be helpful. More specifically, it appeared that whereas 3-shot operation was favored up to three years ago, a preference for 2-shot operation then emerged, and that now the decision usually lay between 1-shot and 2-shot, and was governed largely by whether urban or rural service was involved. Switch operation was stated as now being almost entirely from d.c. source.

Regulating problems were discussed broadly. While step-type units are evidently enjoying increasing favor, many systems cling to induction units. One system stated its broad objective in regulation had been defined as 117.5-120 volts at the customer's meter for first class service, 116-121 for good service. The possibility of series capacitors' finding application was discussed, but for performance it is still necessary to look mainly to the east for operating experience.

Accounts of case histories and specific procedures made up the discussions of fire prevention for substations, a subject which had been developed with some thoroughness a year ago, and of rehabilitating high-voltage bushings. Costs of this latter procedure were given in one study as amounting to 10-15% the cost of the bushing itself.

Safety Group

Obsolescence, an eternal problem for metering departments, is now becoming important with reference to meters purchased in the 1914-26 era, and the necessity for exchanging experience, finding the best solution is generally felt. Protection of meters from corrosion, a problem confined almost entirely to the West Coast, was felt to be important because of the difficulty of opening meters which have corroded bases without allowing particles to fall into the mechanism. Especially is this true in the field. Aluminum die castings are troublesome, as well as older forms, and several methods of treatment with various types of lacquers and varnishes were described. Other discussions dealt with temperature error correction on old-style meters, field testing.

General Meetings

Pole-top resuscitation was a new subject a year ago and found few systems prepared to offer much variety of experience with the method. This year's discussion dealt with case histories and with methods of training linemen in the method's use. More evidence was accumulated to show that resuscitation has its great chance of success in a brief interval following the accident—an interval measured in seconds rather than minutes. In other parts of the group's program grounding procedures, and methods of testing and using rubber gloves, were brought up to date.

Meter Group

In both North and South, the concluding session of the Operating Economics Section was a general assembly, addressed by an imported speaker.

In Oakland, Prof. Elliott G. Ried, director of the Guggenheim Aeronautical Laboratory, Stanford University, spoke on "Air Power in the Present War." He described some of the factors bearing on air power, some of the rapidly changing concepts with reference to employment of the air arm. He stated that America has an unequalled background of pioneering in air research, and supremacy in equipment produced, and that once the country overcomes the handicap of a slow start, its all-round superiority will quickly become apparent. On questions like "how about the bomb-sight," he professed no knowledge.

The speaker at Pasadena was Dr. R. W. Sorensen, of Cal-Tech's Electrical Engineering Dept., who is president of the American Institute of Electrical Engineers. His address on "Electrical Engineers from Coast to Coast" was an informal account of his recent contacts with engineers in many fields and an appeal for engineers to make themselves heard. He decried the inarticulateness of engineers, which he said sets them to one side in the march of political and economic events. He urged engineers to find better ways of exchanging information, of making their voice heard, in order that clear thinking and engineering approach might not be lost through inability to make himself understood.

Breaking into its nine committees the first day, and coming together in a joint

At the Friday luncheon in Oakland were (left to right) Shep Murray, Westinghouse Supply; F. C. McLaughlin, Southern Calif. Edison; Stanley Scarfe, G-E; Ed Wood (right), supt. of transportation, PG and E, handled the transportation group's session at the Northern Conclave

ness Development Section, under R. C. McFadden, So. Cal. Edison, chairman, and E. G. Stahl, San Joaquin PG and E, vice chairman, pitched into some of the commercial men's most controversial or blockading issues of current time at both the Oakland and Pasadena conclaves.

Fluorescent lighting, which dominated the lighting group meetings, emerged as the first topic at both conclave's general assembly of the entire sectioin. In Oakland, Clark Baker, lighting counsellor, Northern California Electrical Bureau and Harry Carroll, PG and E commercial and industrial sales manager, discussed it. In Pasadena, Frank A. Hansen, director, Western Institute of Light and Vision led a group to discuss it from the viewpoint of various interested parties—customer, fixture man, lamp man and utility.

Hansen, talking from the customer's view, told that three states contemplate legislation to protect customers from malpractice in fluorescent lighting equipment. "Our first duty is to the public," he was emphatic.

Barney Selten, Solar Lighting Co., Los Angeles and president of the Lighting Fixture Industries of Southern California, told without bitterness how fixture designers had had to satisfy customers despite changing equipment, eliminate "bugs" in early operation, provide power factor correction.

He asked three things: that a more equitable purchasing policy be developed to give some protection to the reliable, ethical lighting fixture maker over the "gold rush" type; that real standards be developed for fluorescent equipment; and that manufacturers of lamps try to make them smaller instead of larger.

W. H. Robinson, Jr., assistant manager, South Pacific division, G-E Lamp, told how orderly introduction of fluorescent was disturbed by the use of the source at both world fairs with a tremendous public demand created. The Fluolier manufacturers and RLM, he said, were bringing about standards. Longer burning hours of the good installations, he felt, would offset decreased connected load and improve load factor.

George Rankin, Edison, said that utilities were strong for the new light source if used properly but that if sold improperly the utility had longest to live with the customer and all the grief to adjust. The early problems of wattage loss, low power factor and TIF, or telephone interference factor, were being solved.

At Oakland, Clark Baker presented fluorescent lighting entirely from the customer's standpoint. He felt that the customer was being subjected to experiments in this field and experience was being neglected; that there was too much misinformation rather then authenticated information.

Harry Carroll, PG and E, then presented the utility's stand on fluorescent lighting, warned about lighting "experts" that were taking the play away from full-fledged fluorescent men. Carroll felt that to make fluorescent lighting more successful, "we ought to use it more ourselves, thereby set a standard that the public will respect and follow." He suggested that speakers be scheduled for luncheons and club meetings.

R. E. Fisher, vice president PG and E, reported on the sales campaign plans of the Edison Electric Institute of which he is the chairman. He declared that we "ought to take care of the bread-and-butter business" and let war defense business take care of itself. He carefully outlined various committees in the institute, citing the splendid work that had been laid out to aid the industry in the future. At Pasadena, E. A. Long gave his report for him.

Clark Baker is proving at the North Conclave that you can save a customer money but not give him the right type of fluorescent lighting

A light, satiric note was injected into this morning meeting by Bill Cyr, associate editor of ELECTRICAL WEST, who presented his epic talk on "Water Heaters Everywhere and Not a Drop to Drink." In this witty harangue, the "professor" presented some amazing facts, revealed no end of varieties and offered several new hot (water) ideas himself.

J. O. Holbrook, asst. general sales manager, The Paraffine Cos., on the contrary, had some serious remarks to make about markets, surveys and analysis at both conclaves. "Consumer movements have got out of hand," he stated. "As a result, we will have to know our markets much better, predetermine volume, watch our sources for trends." Holbrook declared that state and city governments, banks, trade associations were good sources for such market information.

Red Seal Adequate Wiring

Possibilities of conducting classes of prospective home builders as a part of the adult educational program under the George Dean Act in cooperation with schools were discussed at both conclaves by this committee, under chairman George Zelhart, PG and E, Fresno. The importance of wiring in home planning could be taught thus to selected interested prospects along with the needs for plumbing, decoration and sound construction.

Meeting jointly with the Standardized Service Entrance committee, headed by J. H. Pengilly, Square D. Co., in the Oakland conclave it was recommended that supplies of the standardized service drawing and specification sheets be furnished to Red Seal contact men to try out its acceptance. In Pasadena, however, the decision went much further. It was asked that the standardized service equipment be added to the Red Seal requirements as a recommendation and made a part of the literature printed for distribution on Red Seal in Southern California.

Code and Ordinance Committee

Effort was made in both meetings to simplify the standard electrical ordinance, make it fit more closely with the 1940 National Electrical Code. In Oakland, under chairman C. E. Heise, the plan met no opposition. In Pasadena, under vice chairman E. F. Watkins, Edison, the committee vigorously discussed many of the issues and the new standard ordinance will probably represent a compromise on some of these not yet accepted NECode changes.

General Lighting Group

Residential lighting programs managed to squeeze in for some discussion at both conclaves, despite the preponderant overbrilliance of fluorescent lighting as a topic of talk. John Walsh, PG and E, was chairman in Oakland's light conversation; W. H. Robinson, jr., G-E Lamp, at Pasadena. Residential lighting promotion centered around use of the light conditioning accessories and selling program. C. H. Wissing, Silvray, led discussion at Oakland; G. H. P. Dellmann, San Diego Gas & Electric, and J. T. Deppe, Central Arizona L. & P., at Pasadena.

New lighting sources were demonstrated by Sam Hazelton, jr., G-E Lamp, at Oakland; by Alston Rodgers, G-E Lamp, at Pasadena. Fluorescent lighting applications, Ken Knopf, Westinghouse, led with at Oakland; Frank Anderson at Pasadena. It proved a warm topic. In reviewing the past, present and future both John Walsh, at Oakland, and W. A. Cyr, at Pasadena, declared fluorescent lighting a new crossroad, needing new handling, new lighting levels, fullest use of its great potentialities or, as surveys indicated, it would end up with not only less wattage but less lumens. Industrial lighting, talked of by H. H. Robison, PG and E, Oakland, and W. Trent German, Edison, at Pasadena, probed the possible effect of war production on lighting need. W. E. Carlson, and W. H. Robinson, both of G-E Lamp, San Francisco and Los Angeles, respectively, opened the session discussing "Lighting America."

Industrial Power and Heating

Plans for reporting types and amounts of business gained and lost to competitive power sources and to develop a sales program to offset such competition were discussed by the industrial power and heating group under the chairmanship of G. N. Hawley, So. Cal. Ed. Uniform report forms are to be developed.

J. P. McElroy, PG and E, reported on bottled gas competition, expressing the opinion that although such competition was keen now, the increasing demand for butane for motor fuel and chemical processes will remove it from the field in two to five years.

Welder ratings as affecting power demand came up for review at the Pasadena meeting, when H. G. Dillin, San Diego G & E, and C. L. Ashley, Edison, introduced the work done last year. Uniform ratings and policy for all utilities are being sought and the committee will work toward that end this year.

Agricultural Power Group

Methods of promoting agricultural power load in a highly saturated market where use is already high occupied the attention of the agricultural power group under the leadership of B. D. Moses, U.C. agricultural engineering professor. A. M. Frost, PG and E, contended that the profit objective—for the farmer, utility, manufacturer and dealer—should be foremost. T. A. Wood, PG and E, pointed to the dangers involved in high-pressure salesmanship in the poultry field, where able farm management as well as adequate and complete electric service is necessary for the farmer.

A survey of 100 dairies, reported by T. W. Christensen, PG and E, showed prospective electrical equipment business ranging from $750 to $2,000 per dairy. Data on six electrified dairies showed a total annual consumption of 149,347 kw.-hr. at a total cost of $2,023.66, or an average rate of 1.35c per kw.-hr. Total investment in electrical equipment was $13,500. A plea for greater cooperation in working with 4-H Clubs and Future Farmers of America groups to implant the electrical idea, was made by Paul L. Ford, PG and E. How the growth of quick-freezing of fruits and vegetables has increased electrical usage was outlined by A. B. Conant.

At Pasadena, under discussion leader L. W. Smith, Edison, V. A. Bloxham, Edison, discussed promotional and sales methods. Dr. R. P. Gimgerich, health officer, in reviewing electricity in the dairy industry, held out promise of further acceptance of milk sterilization and vitamin fortification by electrical means.

A novel approach to brooding was presented by W. E. Lyon, Lyon Rural Electric Co., San Diego, when he presented charts indicating the moisture need and water vapor discharge

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of chicks of various ages and kinds as a scientific basis upon which to design brooder equipment. James R. Mersen, State Polytechnic School, San Luis Obispo gave the Pasadena meeting a high respect for the purposes, the philosophy, and the rudimentary mechanical and electrical training given to agricultural students who will be tomorrow's farmers.

Pete Holmes conducted the round table discussion on butane competition. Important points brought out were that butane contains elements of far greater importance in airplane fuel, other chemicals, and that farmers setting up equipment to operate dependent on this fuel may find it withdrawn for war needs and their investment lost.

Range and Water Heater Group

Warmest discussion at both conclaves, in the Business Development Section at least, came in the range and water heater forums, conducted in Oakland by B. W. Reynolds, PG and E, and A. W. Althouse, Edison, at Pasadena.

"Mortality," thrown out frankly by Kenneth Hampton, Valley Electrical Supply, Fresno, at both meetings, proved a challenge to everyone. Liquid gas, he said, asphyxiated most old electric ranges, so the San Joaquin program has been aimed to protect this business. Dealers, to merit cooperative help, must display and sell electric ranges. Users are called on regularly, old ranges modernized and repaired, satisfaction always kept foremost. When customers move, effort is made to keep them using electric.

Importance of a coordinated program between utilities and suppliers with their dealers was made evident in a description of the success of such activities in Washington and Montana by Charles Meier, Westinghouse, at Oakland. In Pasadena W. E. Cranston, Thermador, led discussion into proposed coordinated campaigns of all utilities and suppliers in southern California.

How to secure and hold dealer interest in electric ranges was equally frankly argued. In Oakland R. D. Thomson contrasted the appeals, both fancied and real, of gas equipment from the dealer's viewpoint to those of the electric, not so well appreciated. Al Bauerman, Hotpoint, speaking for Harold Conklin, described the multitude of dealer helps available to dealers by which to make a better presentation to the customer. H. L. Moore described these at the Pasadena meeting.

Water heater standardization, described in Oakland by Howard Oliphant; in Pasadena by C. H. Kaufman, Westinghouse, would substitute a limited number of models for the 530 or more which must be made now to meet divergent demands. Proposed standards would probably call for lower wattage elements, larger tank sizes, but because of standardization should increase volume, reduce overhead and permit marked reductions in price. Combination sales of ranges and water heaters would be more easily made. Installation too. W. S. Fleming, Nev. Cal., led discussion at Pasadena on sales to range users.

Moderator at the Southern Conclave panel discussion was S. E. Gates (standing) of General Electric. Among his panel were Paul Armstrong, Calif. Fruit Growers Assn.; John Canady, Lockheed; Fox Chase, Columbia Broadcasting Co.; Thurston Ross, Univ. of Southern California; J. A. Purdy, Bank of America; W. G. Gerrems, Douglas Aircraft; E. M. Barber, Boyle Mfg. Co.; Fred Metzler, 20th Century-Fox Corp., and F. B. DeLong, vice-president, Columbia Steel Corp.

Administrative Services Section

High peak of the Administrative Services Section action at both conclaves, directed by E. A. Long, PG and E, San Francisco, chairman, and S. W. Murray, Westinghouse Supply, Los Angeles as vice-chairman, was the closing general meeting at each session. These panel discussions, "How to Develop a Public Relations Consciousness Throughout an Organization," described elsewhere in this report, were supported by detail study of some of the underlying aspects of the public relations idea in credits, collections, women's committee activities, purchasing and stores, transportation and accounting.

Accounting Group

Seeking uniformity and time saving in the voluminous and intricate accounting procedure prescribed by the Federal Power Commission, state regulatory bodies and managements themselves, the accountants, under F. C. McLaughlin, Edison, mulled over their intricate procedures.

Credits, Collections, Customer Relations

Under the leadership of L. C. Rausch, district mgr., Coast Counties Gas & Electric Co., the credit collections and customer relations group met Thursday morning at the northern conclave and pitched into the many and variable problems facing these departments.

Paul Thompson, PG and E, San Rafael, was the first discussion leader. He passed typical bills through the group to more fully emphasize his statements. It was a unanimous conclusion that small power bills were confusing, that there should be more information on the bills. That installment purchases and power bills should be kept separately, as with Southern Calif. Edison, and PG and E, met with divided opinion.

K. L. Boosey, PG and E, San Jose, discussed neighborhood collection agencies and there was much controversy on this subject. The evils of pay stations were cited in certain districts, while in others they were declared highly satisfactory and profitable.

In the realm of public relations, Ray W. Piercy, East Bay Div., PG and E, explained the fine emergency service rendered by his utility, felt that the first impression on the customer was most important, and discussed the customer contacts now being made, cheaply and accurately via the telephone.

Harry W. Smith, vice-president, Bank of America, gave an excellent talk to the group before the Thursday afternoon session on "Democracy in a changing world."

In the southern meeting, Charles Davies, San Diego G&E, presided; Leon Heseman covered the monthly statement form subject; Lloyd Dolan led the arguments over the neighborhood collection agencies; the subjects of reconnections after hours and applications by phone were led by L. E. Jenkins. Feature speaker was Harrison Mathews, professor, Woodbury College, on the subject, "What do the next few years offer?"

Purchasing and Stores

Recommendations of both northern and southern groups were correlated in respect to standard packages for pole line hardware after the subject was discussed liberally. A final report is to be submitted at the next conclave, according to William deWaard, chairman, San Diego G&E. H. H. Scoville, PG and E, heads up this standardization work. B. D. Haugh and J. K. Uhler, Edison, reported on economical equipment for handling of poles in district store yards by conversion of old line trucks.

Of the re-use of second hand material, W. F. Dickinson told of methods used to salvage and grade copper and lead.

E. A. Long, PG and E, and F. A. Watkins, Edison, respectively, talked of reciprocity in purchasing, particularly of abuses of this practice.

Transportation Group

Sponsored by E. C. Wood, supt. of transportation, PG and E, San Francisco, a cross section of automotive engineers in charge of various fleets, met Thursday in the north and came to certain conclusions regarding body design for line and electric service work.

Inspection of automotive equipment was advocated by Wood in his paper so that trouble can be remedied. "We may obtain desired results at the least cost by this good engineering," Wood declared.

Finishing its work in one day of intensive meeting, the group after the Pasadena meeting adjourned to attend the convention of the American Trucking Assn., in Los Angeles, and inspect its exhibits of transportation.

The range and water heater group, conducted by A. W. Althouse, at Pasadena was so well attended the crowd overflowed into the halls. The meeting had to be shifted to the outdoor patio

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Sixth Annual NEL & P Conference

Fluorescent lighting heads the show at the commercial sales discussions in Portland

IF YOU sell fluorescent lighting simply on the basis of saving money for the customer, you are not giving the customer real lighting service. The higher levels of illumination with complete eye comfort that are possible to fluorescent lighting makes the advent of this new service the equivalent of the "better light—better sight" idea in the promotion of a public consciousness of good lighting.

These ideas formed the keynote of the sixth annual Commercial Sales conference held at the Heathman Hotel, Portland, Ore., Nov. 13-15, under the sponsorship of the Northwest Electric Light & Power Assn. Two days of this conference, which was presided over by A. H. Greisser, Portland General Electric Co., were devoted to problems of selling fluorescent lighting, while the third day was given over to selling commercial cooking and heating. Nearly 100 utility salesmen in the commercial field and representatives of manufacturers and distributors of fluorescent fixtures and heavy duty cooking equipment participated.

Featured in the fluorescent part of the program was A. B. O'Day, executive engineer, Lamp Dept., General Electric Co., Nela Park. O'Day occupied a large part of one session, tracing the development of fluorescent units from the first that appeared on the market to the present new 100-watt, 60-in. lamp. "The quality we can get with fluorescent lamps gives us new horizons to shoot at in selling lighting," he said. "With incandescent sources, we were limited from a practical standpoint to 30 or 40-ft. candles. With fluorescent sources we can easily produce 100-ft. candles economically to the customer and with comfort to the users of this light." These thoughts were echoed and amplified by Paul Marble, Puget Sound Power & Light Co., who led a discussion on how to sell higher levels of illumination in fluorescent lamps. Hilbert S. Johnson, Portland General Electric Co., discussed the present availability of fluorescent lamp fixtures, introducing Fred Baker of the Baker-Barkon, Portland, who were among the earlier experimenters in fluorescent fixtures on the Pacific coast.

Architects, as a rule, welcome the expert advice of lighting salesmen and like to have a file on the latest information on fluorescent lamp fixtures, Glenn Stanton, president of the Oregon Chapter, A.I.A., told the group. The manner in which Portland General Electric Co. conducts its contacts with architects was outlined by H. K. Stevens of that company.

A survey of 31 typical fluorescent installations in the Puget Sound Power & Light territory showed a loss of 47 per cent in connected load and 15 per cent in kw.-hr. consumption. The average foot-candles, however, went up from 10.7 before the installation of fluorescent to 14.7 after. Four of the 31 jobs showed a gain in connected load; 10 showed increased use of kw.-hr., and 15 had an increase in lighting levels, according to a report by C. T. Bakeman, Puget Sound Power & Light Co.

Series of Discussions

A series of discussions on selling lighting in specialized fields was introduced as follows: for the restaurant and bakery, by W. J. Moreland, Northwestern Electric Co.; for the drug store, by William A. Newman, Washington Water Power Co.; for the service station, by Virgil S. Goldsberry, Northwestern Electric Co.; and in industry, by T. W. Fitch, Portland General Electric Co. The capabilities and limitations of germicidal lamps and the development of new types of these lamps was told by Walter E. Potter, Lamp Dept., General Electric Co., Portland.

The low use customer came in for attention through a discussion, by Loyd E. Larsen, Northwest representative of Light Conditioning Sales Service, of campaigns on adapters (incandescent) units such as have been successfully carried on by several companies in the territory.

In the sessions on commercial cooking and heating successful methods of selling heavy duty equipment were reviewed by Orland C. Mayer, Idaho Power Co., and C. W. Brissenden, Portland General Electric Co. Harold Huggins, Edison G.E. Applianee Co., Los Angeles, discussing sales presentations, urged the salesmen to stress the profit motive to the restaurant man and to be sure to talk his language leaving out the technicalities.

Symposium

Mr. Huggins and A. K. Gaylord, F. S. Lang Mfg. Co., Seattle, and O. A. Alderman, McGraw Electric Co., Seattle, participated in a symposium on new or improved equipment now being offered by their respective companies.

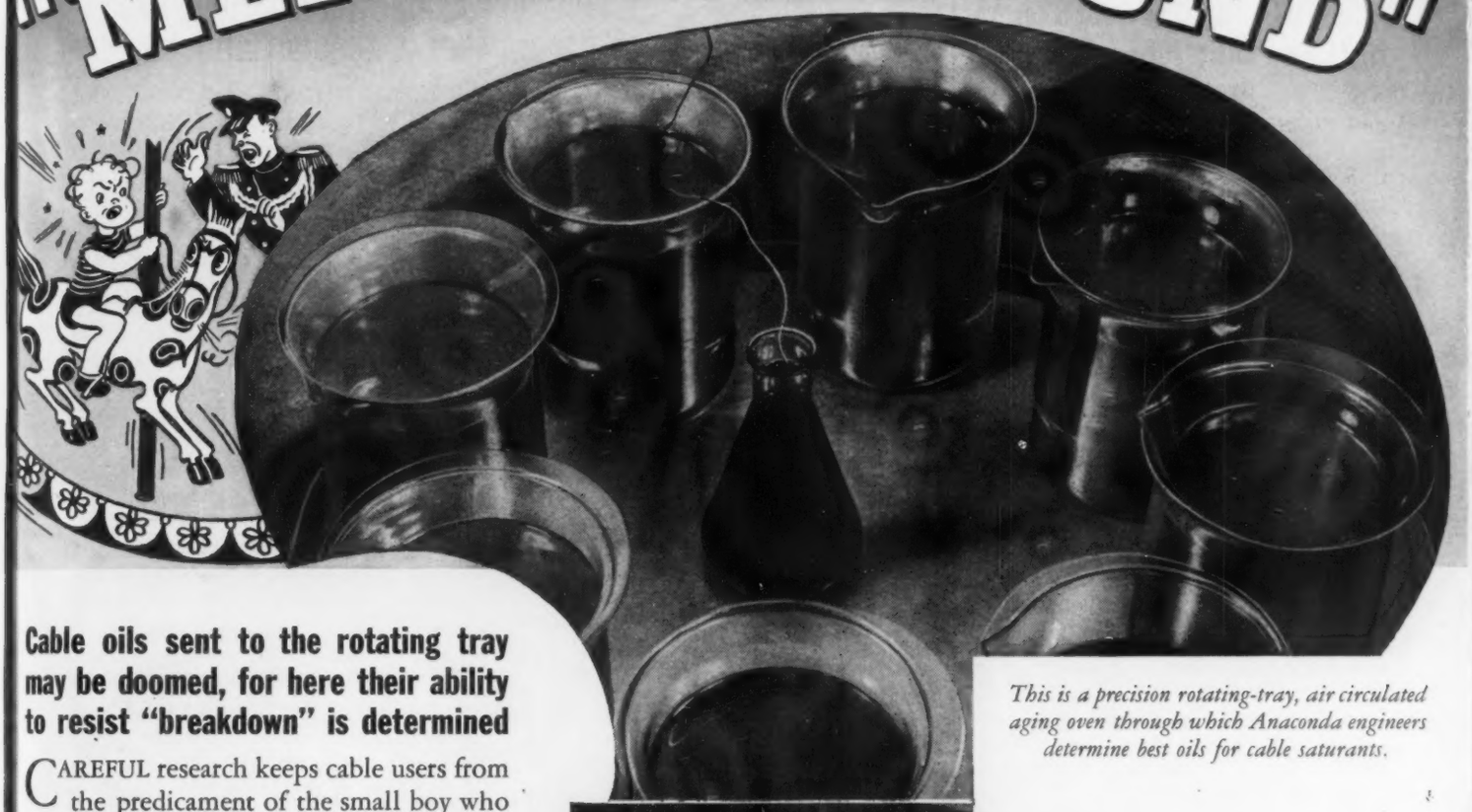
Jack Dugan, Puget Sound Power & Light Co., outlined the successive steps necessary to be taken in selling electric cooking equipment to schools. By following a proven method of contacting PTA groups and school boards in proper sequence, this company has reached 80 per cent electric saturation in the school cafeterias in the company's territory. Daniel Brown, Portland General Electric Co., reported on attending the recent National Commercial Electric Cooking Council meeting in Chicago, relaying to the group the pith of every speech or report made at that meeting.

In a section of the program devoted to miscellaneous heating, led by Albert Gruber, The Washington Water Power Co., a discussion of installations of near infra-red for drying enamel, paint, lacquer and ink created great interest due to the growing possibilities for load building by this comparatively new application.

The conference was opened and welcomed on behalf of the local companies by Walter W. R. May, Portland General Electric Co., who outlined the necessity for aggressive load building in the commercial field in order to increase load factor so as to reduce the average cost of kw.-hr. to customers. D. B. Leonard, Pacific Power & Light Co., and chairman of the Business Development Section of the Association, responding to this opening address, emphasized the necessity for continuous sales effort in the commercial field not only to build load but to save load mortality.

Advertising methods were discussed at a dinner meeting attended chiefly by commercial sales supervisors of the several companies. Inspection trips to fluorescent lighting and commercial cooking installations in downtown Portland were made a feature of the conference each evening.

A not so merry "MERRY-GO-ROUND"



Cable oils sent to the rotating tray may be doomed, for here their ability to resist "breakdown" is determined

CAREFUL research keeps cable users from the predicament of the small boy who finds that the "merry-go-round" has broken down. Anaconda engineers continually are building greater resistance to "breakdown" into Anaconda wires and cables through tests such as the one shown here.

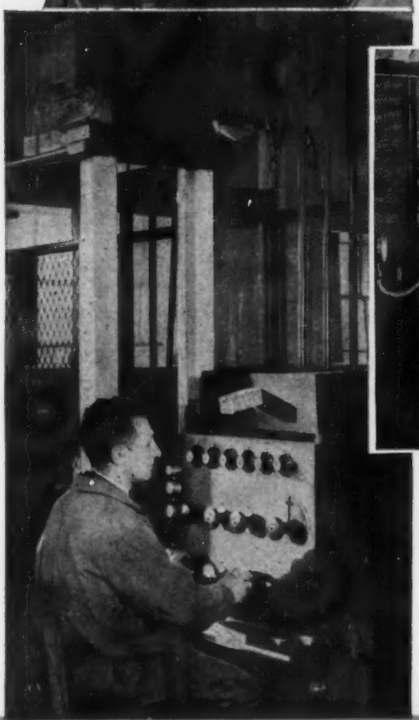
It is an oil aging oven in which there is less than ½° total temperature differential at all times. It is a scvere test for the oils and only those that stand up... those that show the greatest chemical and electrical stability... are chosen. Further improvements in cable saturants are facilitated by laboratory methods of saturating tape wound cable models and subjecting them to cycles of elevated temperature and stress.

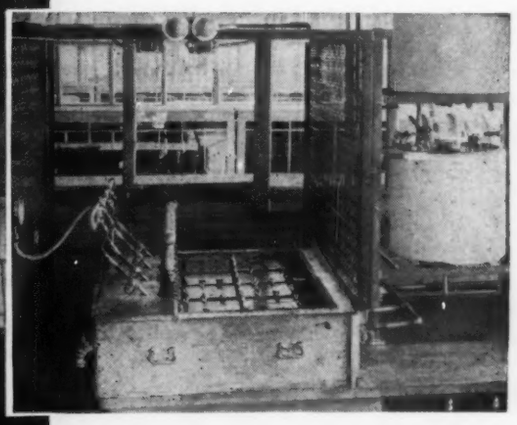
Painstaking research methods like these can mean but one thing to you . . . that wires and cables bearing the Anaconda trademark are of the highest quality.

ANACONDA
from mine to consumer

40351

This is a precision rotating-tray, air circulated aging oven through which Anaconda engineers determine best oils for cable saturants.





Above—cable model tanks mounted in thermostatically controlled bath with high-voltage vacuum and pressure entries.

•

Left—dielectric properties of cable models under test are studied by means of this bridge.

USE MODERN IMPROVED **Anaconda Wire & Cable**

ANACONDA WIRE & CABLE COMPANY, General Offices: 25 Broadway, New York City; Chicago Office: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company. Sales Offices in Principal Cities

NEWS OF THE INDUSTRY

UTILITIES BOARD PASSES HETCHY PLAN; ICKES SPEAKS

San Francisco will pay Pacific Gas and Electric Co. $4,900,000 a year for use of PG and E's local power distribution facilities if Plan E reported tentatively approved by Secretary Ickes.

Plan E is the latest and newest proposal for municipal acquisition of a system to supply San Francisco with electric energy. It has the approval of city and company officials and was passed last month by the Public Utilities Commission.

Secretary Ickes withheld approval through November. It was said his aids completed their study of the plan as presented to them by Major Rossie in Washington last week.

Estimates on the amount of net return to the city because of the lease agreement had previously been placed at $2,500,000. This means that incoming revenue would have to be at the rate of $7,400,000 a year.

Even with Ickes' approval, the California Railroad Commission will have to approve on the agreement before it is placed into operation.

Highlights of the plan are: The lease is for a ten-year period, subject to termination by either party on six months' notice, unless the city enters into competition with PG and E, in which event the company can cancel in 30 days.

The company will continue to supply power to Treasure Island, Yerba Buena Island, the San Francisco-Oakland Bay bridge and its railroads. All additions and betterments necessary to meet consumer demands will be made by the company at the city's request. Necessary standby service will also be supplied by the PG and E.

★ Time has been the essence in San Francisco's dealings with Secy. Ickes. Both the Federal courts and the calendar are holding the clock. The present PG and E marketing agreement expires in mid-1941. And court extensions won't go on forever.

● BY RESOLUTION, the Clark County, Wash., PUD commissioners have directed Guy C. Meyers, fiscal agent, to offer $3,500,000 cash for the distribution facilities of the Northwestern Electric, Pacific Power & Light, and the Portland General Electric companies serving Clark County areas. The offer also provides for the payment of accounts receivable and materials and supplies on hand at cost or book value.

GOAL POSTS

Homes in a 100-block area of southeastern Salt Lake City were "blacked out" recently—some residences for nearly two hours—because a football landed in the wrong place.

Dropkicked—or perhaps punted—by an unidentified sandlot player about 6:15 p.m., the football tangled up some wires at the top of a utility pole.

Frantic calls from residences brought Utah Power & Light Co. trouble-shooters to the scene. Shorting two power lines, the misdirected football caused blowouts of junction fuses, cutouts, and what have you on the Emigration subcircuit. Power in all homes was not completely restored until 8:10 p.m.

BONNEVILLE-GRAND COULEE TO HAVE GUARD SERVICE

Establishment of a guard service to protect its 1,000-mi. transmission system and more than 20 power substations from possible sabotage and other damage was disclosed last month by the Bonneville-Grand Coulee Power Administration.

Administrator Paul J. Raver said the new uniformed guard will ultimately comprise between 50 and 60 members.

Under the new plan, the power administration will maintain guards in its buildings at Portland, Vancouver and at other substations, and at strategic points on the Bonneville-Grand Coulee transmission network.

● PRODUCTION of electric energy for public use during September, 1940, totalled 11,762,897,000 kw.-hr., according to a recent FPC report. This represents an increase of 7.5 per cent when compared to the same month, previous year. Average daily production was 392,097,000 kw.-hr. during September which is 0.4 per cent less than average daily production during August, 1940.

● GRAND COULEE, Wash., has made an offer to Three Engineers Co., Inc. to purchase its present plant for $40,000, Mayor Allen Spratlin reported recently. The offer will be accepted, he stated, according to word received by city officials from O. R. Rable, secretary of the company. The city will then amend its application for an RFC loan.

WASHINGTON ELECTRIC TO APPEAL ACQUISITION

Washington Gas and Electric Co., through its president, T. E. Roach, declared late last month that his company would appeal acquisition of its property in the Longview division by PUD No. 1 of Cowlitz County. The district acquired title through a decree signed on Nov. 26.

At that time, Federal Judge Lloyd Black ruled favorably toward the PUD which then formally took over control of the power and steam properties of the utility at Longview and Ryderwood, Wash.

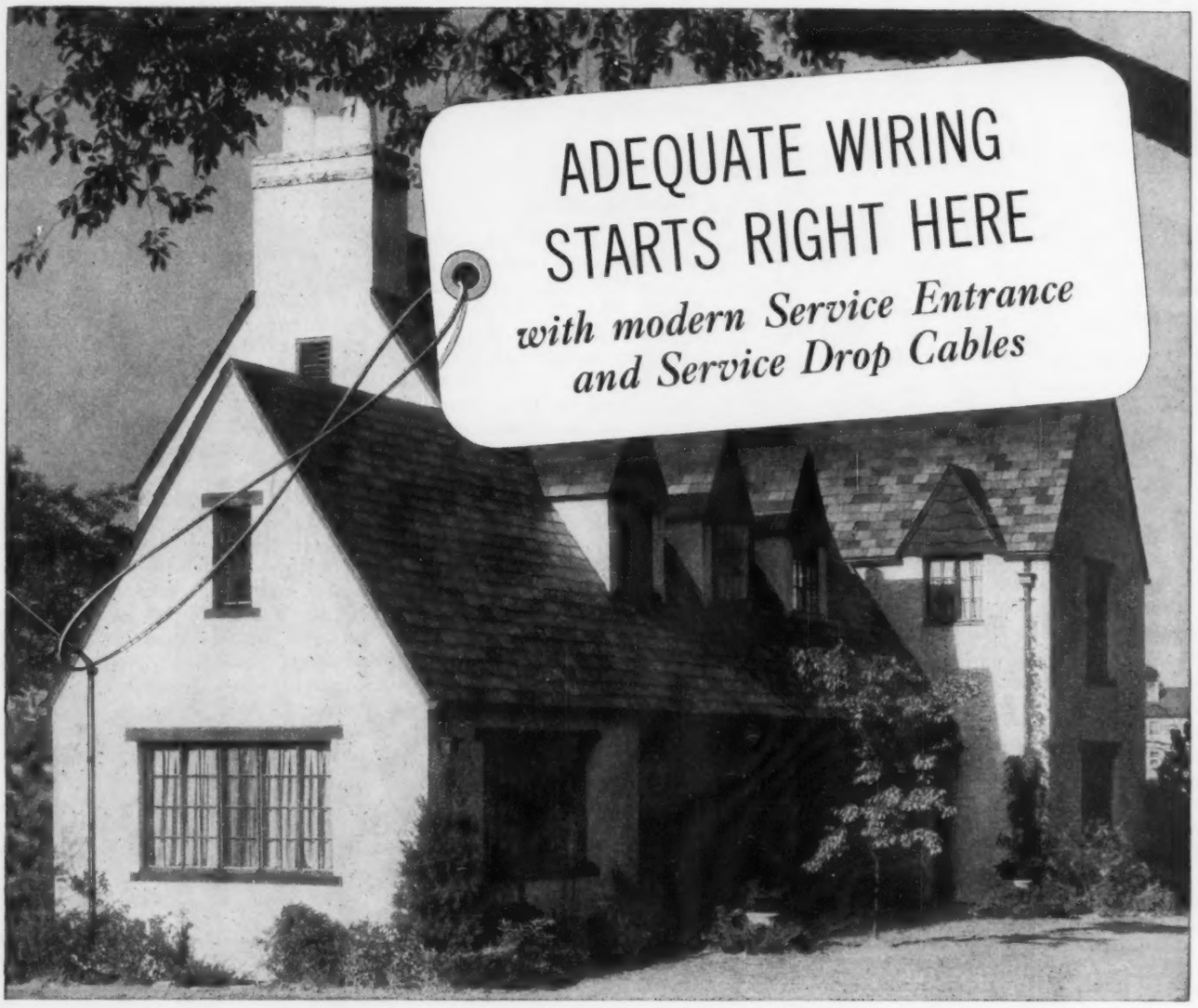
This action had climaxed a court fight of nearly a year. The utility undoubtedly will continue to oppose the acquisition on the grounds that the PUD had not acted within a reasonable time in taking over the properties on which a Federal jury set a purchase price of $6,011,000 last winter.

Bulk of the purchase price goes to the Washington Gas & Electric Co. A subsidiary, the Columbia Electric Development Co. will receive $92,205. The Federal clerk's office received more than $62,000 for one per cent commission for handling the transaction.

Purchase price will be financed by a sale of $6,600,000 in revenue bonds now being offered by a syndicate head of John Nuveen and Co. of Chicago. The PUD district also has plans for acquisition of power distribution facilities in Cowlitz County operated by Puget Sound Power & Light and the Northwestern Electric Co.

★ Second major take-over of utility properties by a PUD (first was Gray's Harbor Railroad & Light Co.) this acquisition is based on condemnation rather than negotiation. Meanwhile other condemnation suits are in abeyance pending studies of Puget Sound properties by the Bonneville Administration.

● THREE POSSIBLE DAM SITES on the Nisqually River to boost electric power production of Tacoma, Wash.'s municipally owned system are among those under preliminary investigation, in a survey being made by J. B. Gongwer, chief engineer in charge of construction for Tacoma City Light. It is stated the investigation is entirely of a preliminary nature, with no certainty that any of these sites will finally be selected.



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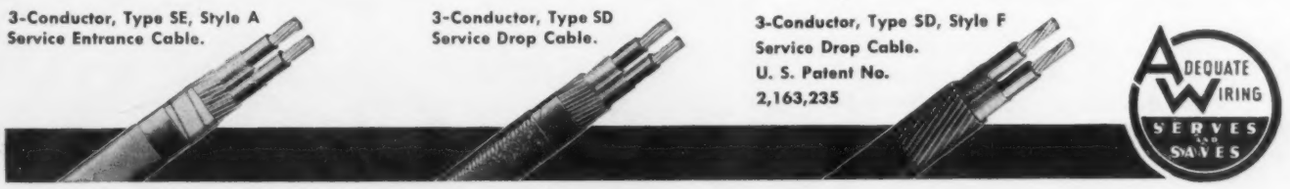
"Amerite" service entrance and service drop cables — approved by Underwriters' Laboratories — are modern in every respect. Of latest "tamperproof" construction, they are economical and easy to install because of their small dimensions and light weight.

Type SE service drop cable can be installed in direct contact with building walls without insulators or conduit. Two types of tamperproof service drop cables are available. Standard Type SD has the conventional braided covering. Type SD, style F, has the patented "embedded-neutral" finish which prevents the objectionable festooning that often occurs when braided coverings deteriorate under long-continued exposure. Write for our service cable catalog.



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UNITED STATES STEEL

FPC Closes Oregon Election Hearings

The Federal Power Commission closed its two-week hearing in Portland, Ore., on expenditures to defeat PUD elections and other legislative activities of the Pacific Power & Light Co., Northwestern Electric Co. and Portland General Electric Co., Nov. 16. Evidence was produced indicating an expenditure of about $266,000 by these three companies on elections or legislation in Oregon and Washington in the 5-year period 1935 to 1940 inclusive. This amounted to about one-quarter of one per cent of the gross income of these companies.

The second week was devoted largely to the affairs of Portland General Electric Co. with Franklin T. Griffith, chairman of the Board, and James H. Polhemus, president, as chief witnesses.

Expenditures by this company totaled $96,500 in 14 PUD and municipal power elections in the period under consideration. Ray E. Brennan, treasurer and comptroller, B. T. McBain, purchasing agent, R. M. Townsend, property agent, and Walter W. R. May, public relations director, were also on the stand. Cassius R. Peck, the company's attorney, handled the case. Samuel H. Crosby, examiner, publicly commended the company on the manner of its presentation.

Among other agencies testifying was the Citizens Committee formed to oppose the Portland PUD at the last primary election as represented by its treasurer. Willis K. Clark. Clark testified his committee spent over $14,000 in this campaign, this fund being raised entirely from Portland business men, property owners and citizens with no contributions from the utility companies. He told how a committee from his group called on Dr. Paul J. Raver, Bonneville Administrator, during the campaign to protest the use of government printing presses to put out what he termed "PUD propaganda."

F. H. Young, director of Oregon Business & Investors, a tax research organization formed to oppose all types of legislation inimical to the interest of taxpayers, also testified as to the activities of his organization supported in part by the utilities. He testified that eight Oregon power companies had paid for sustaining memberships and special campaigns in the period under investigation $40,500.

At the close of the Portland hearing it was announced that the hearing would be resumed in Seattle to go into the affairs of the Washington Taxpayers Assn., whose manager, Floyd Oles, would be on hand with his records of utility contributions in obedience to a Federal court order. General A. H. Beebe, chairman of the Association's executive committee, issued a statement that he still believed the organization was not subject to the Commission's jurisdiction.

Oregon Counties Turn Down PUD Proposals

Six large counties and one fraction of a county in Oregon turned down proposals to form Public Utility Districts in the election Nov. 5. At the same time, PUD proposals in six fractions of other counties were successful. No large majorities were piled up in favor of PUD formation and the total plurality against them in all elections, based on complete returns was 4,704. Total vote cast in all elections was 47,359 in favor and 52,063 against.

Counties rejecting the PUD proposal were Clackamas, Marion, Polk and Washington served by Portland General Electric Co.; Lane and Coos served by Mountain States Power Co.; and a parcel of Crook served by Pacific Power & Light Co. The Crook County parcel was a part of a large district in central Oregon composed also of parts of Deschuttes and Jefferson counties. The proposal was favored in those two counties, but under the Oregon law, Crook has voted itself out, and it will be up to the Hydro Electric Commission to determine whether the other two parcels may go ahead and form a district without Crook.

Other districts in which the voters favored PUD formation were a small portion of Columbia County served by Portland General Electric Co. and Northwestern Electric Co.; town of Clatskania on the lower Columbia River served by West Coast Power Co.; a small portion of Lincoln County on the Coast served by West Coast Power Co., and Union County in the central eastern part of the state served by Eastern Oregon Light & Power Co. In general, it may be said that the urban centers and more populous rural districts voted against PUD formation while the more sparsely settled areas voted in favor.

Washington Says No on Public Ownership

In the shadow of the Grand Coulee and Bonneville power projects, public ownership proposals were defeated Nov. 5 by the voters of three eastern Washington counties, served by The Washington Water Power Co., where the question was on the ballot. Despite powerful political support, public ownership—in the form of public utility districts — was defeated in populous Spokane county, by nearly a two-to-one vote, and also in Adams and Asotin counties.

These counties serve a population of 178,804 persons. Total vote against the PUDs was 41,617; total in favor was 22,290.

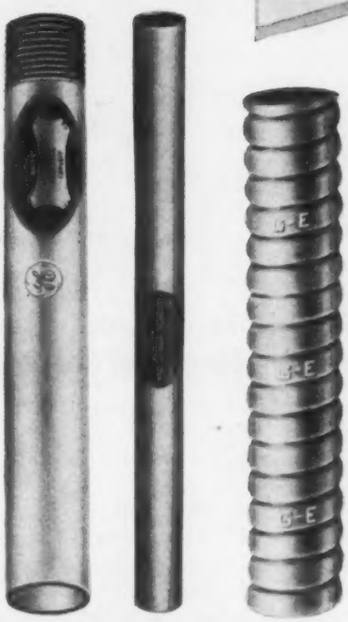
The Spokane proposal, the largest to

PUD ELECTIONS — OREGON
Nov. 5, 1940

PUDS	Sq. Mi.	Served by	Vote For	Vote Against	Majority For	Majority Against
Clackamas	724	Portland G.E.	9,082	11,111		2,029
Washington	551	Portland G.E.	6,376	6,887		511
Marion	755	Portland G.E.	11,027	12,652		1,625
Columbia River	175	Portland G.E.				
Polk	444	Northwestern Elec.	1,219	1,128	91	
		Portland G.E.				
		Mountain States Pr.	2,268	2,557		289
*Lane	800	Mountain States Pr.	2,854	4,625		1,771
Coos	900	Mountain States Pr.	4,350	6,657		2,307
Lincoln	18	West Coast Pwr.	781	506	275	
Clatskania	87	West Coast Pwr.				
		Northwestern Elec.	1,013	236	777	
Central Oregon	849	Pacific Pr. & Lt.				
Deschutes County			3,488	2,411	1,077	
Crook County			684	758		74
Jefferson County			266	159	107	
*Union	520	Eastern Ore. Lt. & Pr.	3,951	2,376	1,575	
		Total Oregon	47,359	52,063	3,902	8,606
*Incomplete					Majority Against—	4,704

PUD ELECTIONS — WASHINGTON
Nov. 5, 1940

PUDS	Served by	Vote For	Vote Against	Majority For	Majority Against
*King (less Seattle)	Puget Sound Power & Light	12,356	12,777		421
*Island	Puget Sound Power & Light	802	1,141		339
*Kitsap	Puget Sound Power & Light	8,787	7,283	1,504	
*Clallam	Puget Sound Power & Light	3,920	2,185	1,735	
*Jefferson	Puget Sound Power & Light	1,529	1,215	314	
*Yakima	Pacific Power & Light	18,253	16,806	1,447	
*Columbia (183 absentee not counted)	Pacific Power & Light	1,035	1,093		58
Spokane	Washington Water Power	20,536	38,975		18,439
Adams	Washington Water Power	1,077	1,186		109
Asotin	Washington Water Power	938	2,241		1,303
	Total Washington	69,233	84,902	5,000	20,669
*Incomplete				Majority Against—	15,669



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Your customers want modern lighting—high intensity lighting.

General Electric will help you meet this desire easily in new buildings. All the different G-E wiring materials you need are ready and waiting for you—all quality materials made to precise specifications. White rigid conduit, four grades of building wire, wiring devices of all sorts.

With old buildings the installation of modern lighting is simple now, too. You can increase wattage capacities enormously by re-wiring with Flamenol* Small Diameter Building Wire. Simply substitute larger size Flamenol for the present wires in existing conduit.

This new G-E synthetic-insulated wire can be obtained wherever you buy other G-E wiring materials. Whole wiring systems can be rewired inexpensively. Flamenol is available in sizes 14 to 4/0. Its insulation is tough, flame-retarding and resistant to moisture, acids, oil, etc. It is approved by the Underwriters' Laboratories. Other materials needed for rewiring will all be found in the G-E line.

For further information about G-E wiring materials to serve modern lighting either in old or new buildings see the nearest G-E Merchandise Distributor. Or mail the coupon below.

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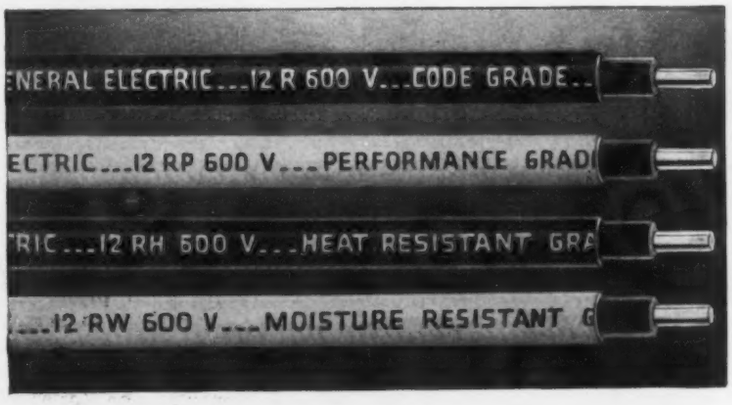
ENERAL ELECTRIC...12 R 600 V...CODE GRADE..
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GENERAL ELECTRIC

be voted on in the state, was regarded as a particularly crushing blow to the public power movement in the Pacific Northwest, following so closely on the heels of a similar defeat at Portland, Ore., last May.

Asotin county voters returned a thumping majority against the PUD even as federal engineers were making surveys for a projected $3,270,000 transmission line into that area, designed to carry Bonneville-Grand Coulee power.

Adams county voters defeated a similar public ownership proposal two years ago. This is the first time Spokane and Asotin counties have voted on public utility district proposals.

Two counties in the Puget Sound area likewise turned down PUD proposals, King County in which Seattle is situated, but with the PUD confined to territory outside Seattle, rejected the proposal by a vote of 12,777 to 12,356. Island County, in Puget Sound, voted 1,141 against to 802 for.

Kitsap County bordering Puget Sound on the Olympic Peninsula side, returned a slight majority in favor of public ownership, 8,787 to 7,283. Clallam and Jefferson Counties, also on the Olympic Peninsula, favored the PUD proposal by a combined vote of 5,449 to 3,400. Puget Sound Power & Light Co. is the chief private utility company serving parts of all these counties in the western part of the state.

In the territory served by Pacific Power & Light Co. two PUD elections were held—one in Yakima County and one in Columbia. Based on complete returns, Yakima favored the formation of a PUD by a vote of 8,253 for to 16,806 against.

PG and E Testifies At SEC Hearing

Testimony to the effect that neither management nor policies of Pacific Gas and Electric Co. have been controlled or influenced by the North American Co. was presented by several witnesses at a series of SEC hearings started in San Francisco on Nov. 12. The hearings were on an application of PG and E for exemption as a holding company under Section 2 (a) 8 of the Holding Company Act. The company asked for exemption from registration as a North American subsidiary. The latter is the largest holder of PG and E securities, owning about 17.2 per cent of the company's outstanding common and preferred shares.

History of the company was traced from its beginning with particular emphasis placed on the purchase of Great Western Power and San Joaquin Light & Power Corp. from North American by PG and E through an exchange of securities. Testimony was introduced by P. M. Downing, vice-president and general manager, to show that economies in operation and lower rates to customers resulted from the consolidation.

Of particular interest was the stand taken by the California Railroad Commission, which entered a 6,000-word statement into the proceedings indicating that at no time in the history of the commission's regulatory dealings with the company had there been any indication of outside control or influence. The statement outlined the authority exercised by the California Commission over rates, accounting practices and security issues. It pointed out that all of the PG and E properties are located within the State of California and that its facilities were physically interconnected and coordinated into an efficient system. The statement was signed by Commission President Ray L. Riley and Ira H. Rowell, attorney.

Following the hearings before SEC Trial Examiner J. G. Clarkson, the application will be taken under advisement.

L. A. Councilman Proposes Aid for Property-Owners

Los Angeles city councilman Roy Hampton last month proposed that the Water and Power Commission devote the $1,000,000 anticipated savings as a result of revised Hoover Dam power contracts to aiding property owners in paying their ornamental lighting assessments on major streets.

The resolution was referred to the Water and Power Commission.

Hampton said the commission has made no indication of how it will use the money, which is expected to be gained as a result of the voting of charter amendments 1-A and 2-A at the last election.

If the $1,000,000 is used to maintain the major ornamental lighting systems, Hampton said, it will amount to about 60 per cent of their total cost.

Electrical Engineers to Receive Personnel Check-list

Electrical engineers of the nation shortly will receive a general questionnaire and technical check list from the National Roster of Scientific and Specialized Personnel in Washington. Purpose of this survey—being conducted in all lines of professions and specialized knowledge fields—is to establish a central register of persons professionally competent readily available for consideration of needs arising from the national preparedness program. The roster is being compiled by the National Resources Planning Board and the Civil Service Commission.

Information obtained through the questionnaires will be translated to punch cards so that all significant data will be readily available when particular needs arise. In addition, there will be set up for each professional group a special committee to evaluate the relative levels of competency of various individuals in the Roster for particular assignments. The Roster will serve another purpose, too—that of conserving men now engaged in important tasks and preventing their withdrawal from work which might detrimentally affect the defense program.

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By
ANGUS-CAMPBELL, INC.

PG and E Spends $26,000,000 on Expansion

Pacific Gas and Electric Co. last month declared its expenditures during 1940 for expanding and improving its electrical facilities will amount to about $26,000,000. This was about $2,000,000 more than was spent in 1939.

Largest of the projects under way is construction of three 50,000 kva. steam plants in Contra Costa County. When completed they will represent an investment of $15,000.000, of which $9,000,000 will have been spent this year.

The company also has under construction a $1,200,000 transmission line from the Martinez and Avon steam plants to the Newark substation; and preliminary work has been launched on the erection of a 28 000 kva hydropower plant at Dutch Flat on the Bear River in Nevada County to cost $3.780,000.

Pacific Tel. & Tel. Discloses 1941 Expenditures

Indicative of the rapid growth of the West is the announcement by N. R. Powley, Pacific Telehone and Telegraph president, that 1941 construction expenditures of the company and its subsidiaries in the Pacific Coast states will total $55.000.000. This follows on the heels of gross expenditures of $46,000,000 in 1940 and puts current expenditures on the pre-depression level.

An outstanding part of the program is the installation of new underground cable on long line routes. This work includes a $7,000,000 job in the Utah-California sector, a 175-mile installation between Portland and Seattle costing $2.000.000 and a 73-mile line between Redding and Weed, Calif. totaling $1,500,000. Other installations are going in between Sacramento and Stockton and San Diego and Los Angeles.

Ziebarth Has Low Bid on Yakima Pole Line

Fritz Ziebarth of Vancouver, Wash., and Long Beach, Calif., bidding $51,636, submitted the only bid to the Bonneville Power administration for construction of the Midway-Yakima 115 kv. wood pole transmission line. Recently Ziebarth secured an award to build one line between Bonneville and The Dalles, Oregon, for $248.989 and another line from Yakima to Ellensburg for $39,052. The new project involves placing some 350 poles with cross-arms, fixtures, guys, channel anchors and ground-wire attachments.

Contracts Awarded

To The Home Electric Co., Tacoma, a contract from the Tacoma Board of Contracts and Awards for furnishing 65,000 lb. of copper wire, $11,176.

!To D. M. Manning, Hysham, Mont. for building 276 mi. of line for The Beartooth Electric Cooperative, Inc., Absarokee, Mont., $239,448.

To E. A. Reither, Aitkin, Minn., for building 185 mi. of line for The High Line Electric Assn., Holyoke, Colo., $127,823.

To Homer G. Johnson, Portland, for building 73 mi. of line for The Clearwater Valley Light & Power Assn., Inc., Lewiston, Idaho, $53,722.

To The Big Horn Construction Co., Sheridan, Wyo. for building 141 mi. of line for The Big Horn Rural Electric Co., Basin, Wyo., $93,346.

To Ofstie Construction Co., Spring Valley, Wis. for building 90 mi. of line for The Grand Valley Rural Power Lines, Inc., Grand Junction, Colo., $69,305.

To The H. A. Risk Pipe & Construction Co., Nebraska City, Nebr. for building 147 mi. of line for the Moon Lake Electric Assn., Inc., Mt. Emmons, Utah, $91,610.

To City Electric Co., Nampo, Idaho, for building 205 mi. of line for The Columbia County Rural Electric Assn., Inc., $120,363.

Gunnison County Electric Assn., Inc. Gunnison, Colo. has been awarded $115.000 to build 110 mi. of line in Gunnison County, and $40,000 for a generation plant.

REA Activities

Delta-Montrose Rural Power Lines Assn., Delta, Colo., has been allotted $36.000 to build 118 mi. of line in Ouray and Montrose Counties.

San Isabel Electric Assn., Inc., Beulah, Colo. has been awarded $7,000 for member connections.

Yampa Valley Electric Cooperative, Inc., Steamboat Springs, Colo. has been awarded $152,000 to build 185 mi. of line in Routt County.

Sulphur Springs Valley Electric Cooperative, Inc., Willcox, Ariz. has been awarded $165.000 to build and acquire 164 mi. of line in Cochise and Graham Counties.

Union Rural Electric Assn., Inc., Brighton, Colo. has been awarded $130.000 to build 151 mi. of line and 24 irrigation pumps in Boulder, Weld, Adams and Jefferson Counties.

Skamania County PUD No. 1, Carson, Wash. has been awarded $28,000 to build 31 mi. of line in Skamania County.

Mason County PUD No. 37, Shelton, Wash. has been awarded $51,000 to build 71 mi. of line in Mason County.

NO OPEN SEAMS! . . . with the NEW BRIEGEL METHOD CONNECTOR

All connectors are finished and smooth with lap seam construction.

A LARGER SHOULDER completely closes the knock-out hole in the box.

A NEW, IMPROVED BONDING-TYPE LOCK NUT locks tighter than ever.

FINE SHEET STEEL CONSTRUCTION makes connectors even stronger, neater and more durable. The inbuilt tensile strength of this sheet steel prevents tube end splits.

B-M LOW PRICES MAKE THESE FITTINGS PRACTICAL FOR EVERY SIZE JOB!

½" size now available, other sizes ready soon.

Patents Pending
Approved by Underwriters Laboratories

Distributed By:

The M. B. Austin Co., Chicago, Ill.
Clifton Conduit Co., Jersey City, N. J.
The Steelduct Co., Youngstown, Ohio
National Enameling & Mfg. Co. Pittsburgh, Pa.
Clayton Mark & Co. Evanston, Ill.
General Electric Co., Bridgeport, Conn.
Enameled Metals Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co. Elmhurst, New York City

BRIEGEL METHOD TOOL CO., Galva, Illinois

FULL Protection *with* PACIFIC ELECTRIC BREAKERS

Reliable, Trouble-Free Service Assured by 34 Years of Specialized Manufacturing

For years of reliable service—ten Pacific Electric Type RDE-48 breakers, 69 kv., 1,000,000 kva., being installed on Bonneville Project. Capacity network devices for voltage indication are optional equipment.

Once oil circuit breakers are installed you expect full protection and reliable, trouble-free service with a minimum of upkeep.

Pacific Electric's 34 years of specialized manufacturing experience assures all of this when you install breakers.

You get fast opening of the circuit with either 2 or 6 breaks per pole, depending upon the rating, and rapid arc extinguishment from the famous Pacific Electric expulsion chambers. You get low oil carbonization and utmost SAFETY.

Equipped with the high-speed Pacific Electric motor-wound spring operating mechanism, you may have automatic reclosing with the first reclosure either immediate or time delay, as desired.

Get all the facts — how scores of other utilities have full protection, save time, money and maintenance with efficient Pacific Electric breakers.

C. H. Cutler
1006 Securities Bldg.
Seattle, Wash.

A. A. Marrs
526 Dwight Bldg.
Kansas City, Mo.

G. B. Kirkwood
437 S. Hill St.
Los Angeles, Calif.

U. N. Halliday
230 U. S. Nat'l Bank Bldg.
Denver, Colo.

C. C. Musgrove
508 Insurance Bldg.
Dallas, Texas

J. E. Redmond Co.
448 W. Madison St.
Phoenix, Ariz.

Filbert & Fredericks
90 West St.
New York, N. Y.

Northwest Supply Co.
P. O. Box 368
Butte, Montana

Walker Electric Co.
818 Jefferson St.
Boise, Idaho

Other Representatives in Principal Cities

Pacific Electric Mfg. Corporation

5815 THIRD ST., SAN FRANCISCO, CALIF. DUNES HIGHWAY, GARY, INDIANA

National Defense Discussed at Edison Conference

National defense was the theme of an industrial sales dept. session held recently with R. C. McFadden, South. Calif. Edison sales manager, chairman.

W. C. Mullendore, executive vice-president, C. E. Houston, vice-president and assistant general manager, and other Edison executives addressed the 120 men of the department on Edison's various relations to national defense operations. Also on the program were Capt. Caden Jenkins, U. S. Army Air Corps Reserve, and Dr. J. H. Vivian. professor of chemical engineering, Univ. of Southern California.

More than $11,000,000 is being spent to strengthen the power facilities of Central and Southern California for national defense, according to Lewis. This includes construction of the new San Diego-Chino transmission line, new sub-station in San Diego and installation of extensive new equipment at Edison's Chino sub-station; construction of Edison's second transmission line to Boulder Dam, installation of Edison's third generator at Boulder Dam, and construction of a new interconnecting station between Edison and PG and E at Piedra, 20 mi. east of Fresno. This will be the second major interconnection between the two power systems. The systems have been interconnected at Magunden for some time.

Oregon PUD Buys Bonneville Power

A 20-year contract for the purchase of up to 4,000 kw. of Columbia River power was executed last month by Bonneville-Grand Coulee Power Administrator Paul J. Raver and the Northern Wasco County (Ore.) people's utility district.

The contract is the eighth and largest executed with utility districts in Oregon and Washington. It provides that power deliveries will start as soon as the district acquires a distribution system either by purchase or by construction. The district agrees to pay for energy at the power administration's standard wholesale rate at one-quarter of a cent per kw.-hr. plus a monthly charge of 75 cents for each kw. of demand. The power will be delivered to the district at a substation to be constructed at The Dalles, Ore. A 115,000-volt transmission line is now being built between Bonneville and The Dalles.

Under the contract the district has agreed to "so manage and operate its electric system, and handle the revenues derived therefrom as to resell power purchased from the administrator at rates which reflect the low cost of Bonneville power, and at the same time are consistent with sound and economical operation."

Grays Harbor PUD Declares Rate Reduction

A rate reduction aggregating $70,000 savings a year to customers, the second since the public utility district took over the Grays Harbor Railway & Light Co. in Aberdeen, Wash., has been announced by the Grays Harbor PUD. The first rate cut, estimated to save customers $150,000 annually, took effect July 1. With the new rate effective Dec. 1, Grays Harbor power costs will be among the lowest in the United States.

At the same time, it was announced a contract for Bonneville power to be delivered immediately, has been signed by the PUD. Contract calls for 2,000 kw. of power for a period of twenty years.

Utah Power Steam Plant Sets New Record

Jordan Steam plant of the Utah Power & Light Co., west of Salt Lake City, set an all-time record recently for daily generation when it passed the million kw.-hr. mark, according to E. F. Bailey, superintendent.

Gross production for the day was 1,104,700 kw.-hr., largest in the plant's history. This increase in capacity is due mainly to reblading of the two low-pressure units for higher ratings. Last year the peak was 980,000 kw.-hr. for one day. In producing this record more than 18 cars of coal were used.

PG and E Man Purchases Electric Relics

Jerry Hill, member of the PG and E general sales staff, has recently returned from an eastern trip, bringing with him a pair of interesting mementos of the incandescent lamp industry of 25 years ago.

At his father's home in Michigan, Hill found two 50-watt, 115-volt lamps which had been used to light a bedroom for 25 years. The lamps, manufactured by General Electric Co., and sold for 50 cents apiece, still burn.

Interesting fact about these old Edison Mazdas is that they were made of opal glass, obviously for the purpose of cutting down glare.

● UTAH POWER & LIGHT Co's new Emigration substation on 18th East st. in Salt Lake City was placed in service and turned over to the Salt Lake division for operation recently. The new substation will relieve both Southeast and Northeast substations of part of the city load.

Barker Elected Committeeman at IAEL Convention

George W. Barker, manager, Northern California Electrical Bureau, San Francisco, was elected executive committeeman for District 4 at the annual conference of the International Association of Electrical Leagues held in Chicago Nov. 14 and 15. He succeeds Elias Strong, manager, Electrical League of Utah, who represented the western area during the past year.

Other national officers elected included John S. Bartlett, Washington, D. C., president; Carl H. Christine, St. Louis, Mo., vice president; John A. Morrison, Philadelphia, treasurer, and O. C. Small of N.E.M.A., secretary. Governors for the first district are Bartlett; second district, William A. Ritt of Minneapolis; third district, Christine; fourth district, Barker; fifth district which is Canada, George W. Austin of Toronto. Other members at large are Ainsley Gray from Chicago, C. E. Delany, Hartford, and Jack A. North of Cleveland.

Barker presented a paper describing the success of his bureau in developing rewiring of commercial buildings on a cooperative basis. Since this is the first work of this kind, his paper attracted deep interest and other leagues may inaugurate similar programs, in the west Spokane, Baker said.

● "BLACKOUT" TYPE CONSTRUCTION will feature the new $11,000,000 Douglas Aircraft Co. plant to be built at Long Beach. To provide complete invisibility from ground or air at night, the plant will be air-conditioned, artificially lighted, and will have duplicate utility services brought into the plant underground.

ELECTRICAL TESTING LABORATORIES

Electrical Photometrical, Chemical and Mechanical Tests. Inspection of Materials and Apparatus at Manufactory.

2 East End Ave. New York

GEO. E. HONN CO.

420 Market St. San Francisco, Calif.

Manufacturers' Representative for

PYREX INSULATORS
S & C PROTECTIVE DEVICES
CORNELL-DUBILIER CAPACITORS
KELLEMS CABLE GRIPS
BLACKBURN CONNECTORS
COLUMBIA TONG TEST AMMETERS —LOW VOLTAGE GENERATORS
BARTLETT TREE TRIMMING EQUIPMENT
METER JEWELS

Inside Facts on the New Allis-Chalmers Distribution Transformer!

MAKES YOUR TRANSFORMER DOLLARS GO FARTHER!

If you think all distribution transformers are pretty much alike . . . require a certain amount of continual servicing, you've got a pleasant surprise in store when you install the new Allis-Chalmers Distribution Transformer on your lines!

For here's a transformer that makes distribution engineers and service men say, "It's a *money-saver* . . . on the pole and on our pocketbooks, too!" Here's why . . .

As soon as you start to connect the leads, big cadmium-plated 3-Way Terminals simplify the wiring job . . . save valuable man hours. Husky steel tanks . . . Spra-Bonderized and given a triple-coat automobile finish against rust . . . are tested under pressure to prevent oil leaks.

Time-proven core and coil construction . . . designed for years of efficient, service-free operation . . . has double conductor insulation . . . double safety against winding failures.

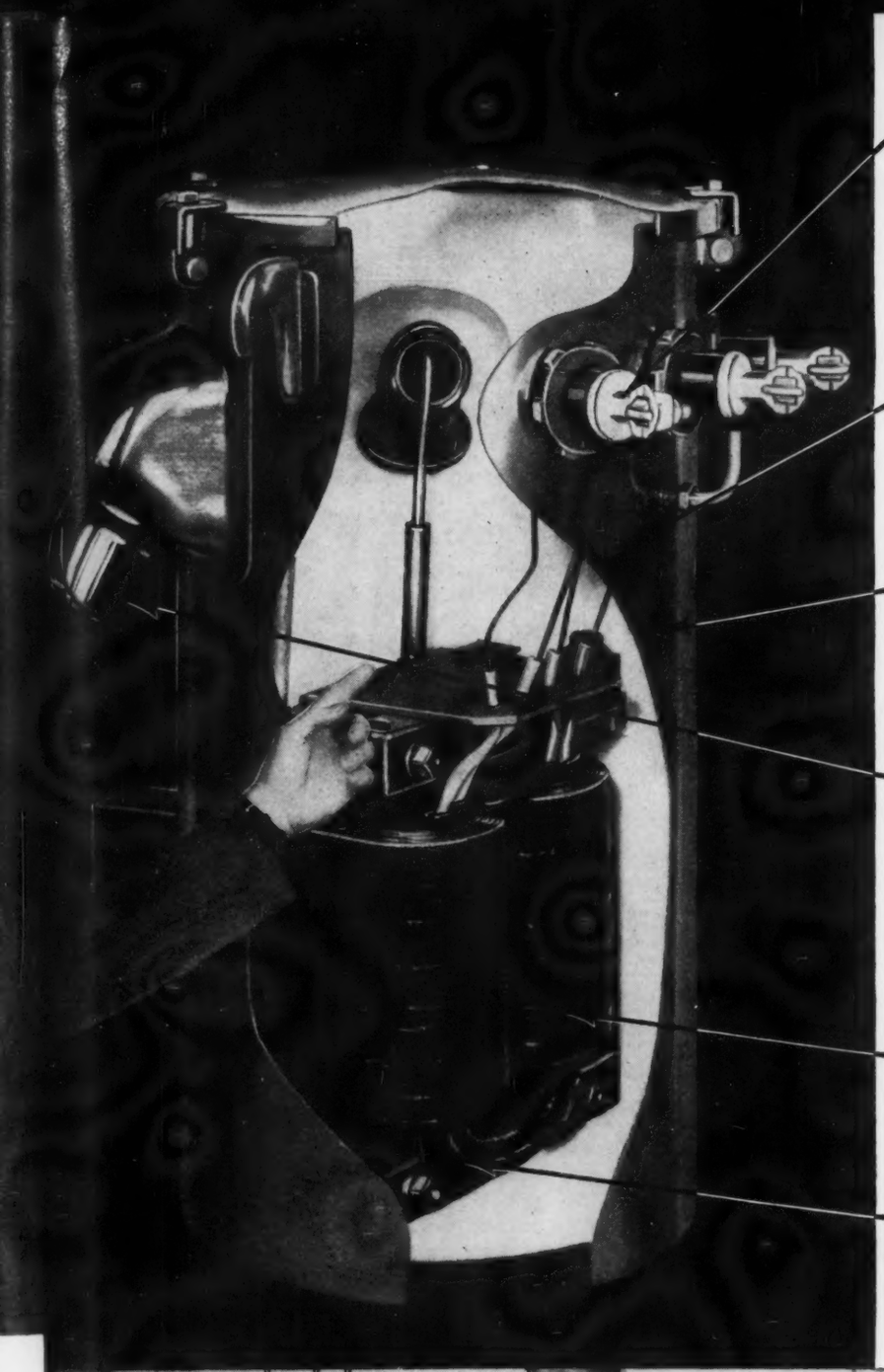
Extra heavy bushings with liberal creepage eliminate excessive voltage stresses and corona . . . reduce radio interference to a new low.

And here's the best news of all! The new Allis-Chalmers Distribution Transformer . . . with all its extra value engineering advances . . . *costs no more* than you pay for ordinary distribution transformers!

Get all the facts on how you can make your transformer dollars go farther. Call the district office near you. Or write direct to Allis-Chalmers, Milwaukee, for your copy of Bulletin B-6096 . . . today!

A-1304

ALLIS-CHALMERS DISTRIBUTION



1 Revolutionary Cadmium-plated 3-Way Terminal Cuts Installation Time . . . Simplifies Wiring Job . . . Minimizes Electrolytic Action on Copper or Aluminum Conductors.

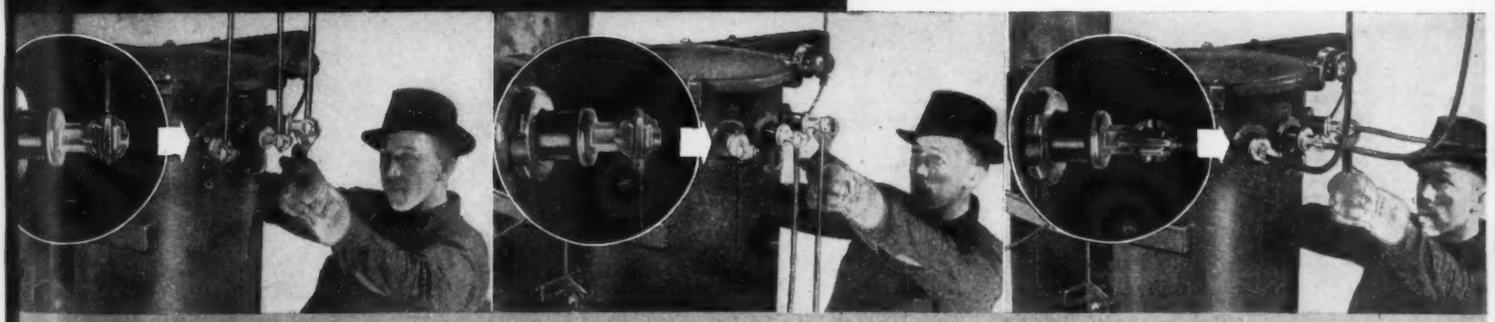
2 New, Durable Steel Tank, Tested Under Pressure . . . Prevents Oil Leakage . . . Assures Long Life.

3 New Spra-bonderizing . . . Plus Triple Coat Automobile Finish . . . Gives Positive 4-Way Rust Protection.

4 Extra-heavy Porcelain Coordinated Bushings with Liberal Creepage . . . Offer Maximum Reliability Under Fog, Dust, Chemical, or Other Adverse Operating Conditions.

5 Double Conductor Insulation Provides Double Safety Against Winding Failures.

6 Time-proven Core and Coil Construction . . . Designed for Years of Efficient, Service-free Operation.



SEE HOW THE NEW 3-WAY TERMINAL WORKS! First and second pictures show how simply and easily leads can be brought to the transformer from both top and bottom. But you don't stop there! For the third picture illustrates an ***extra*** advantage you get with no other terminal! If necessary, leads can be brought straight out from the transformer, without making an extra bend in the conductors or complicating the wiring job. Notice how the tightening tool travels in an ***up and down*** direction eliminating the chance for accidental shorts across the secondary terminals. Notice, too, that a standard lineman's wrench is used. No special tools are needed. You don't have to buy extra fittings. Heavy cadmium plating of the 3-Way Terminal makes it possible to be used with ***both*** copper and aluminum conductors with a minimum of electrolytic action.

TRANSFORMERS *Cut Operating Costs*

TRADE NOTES

Howell Electric Moves Into Larger Reno Headquarters

Outgrowing a compact little store out of which it did a large part of the electrical business of Nevada, Howell Electric Co., with its two associates, Moltzen and Fitch, electrical contractors, and General Air Conditioning Co., operated by Jerry Collier, moved to a new and much larger store at 285 South Virginia St., Reno. In its 120x50-ft. space are a more ample display room and offices for the air conditioning and electrical contracting associates.

G. H. "Duke" Mudd, sales manager for Howell Electric, operates the appliance end of the business. Wiring installation at the new place, including a representative display of both commercial and domestic lighting fixtures, incandescent and fluorescent lighting, from which sales can be made, was installed by Moltzen and Fitch. Thomas Moltzen and L. L. Fitch handle this division of the business. Complete air conditioning with both heating and cooling was installed in the new premises by the General Air Conditioning Co.

CHROMALOX
RANGE UNITS
COOK FOOD AS FAST
AS FOOD WILL COOK!

The most economical, most convenient, and cleanest range unit. Greatest sales features ever! Sell Ranges equipped with Chromalox units and you'll sell more ranges. Use Chromalox units for replacements, too—they fit all ranges. Write for new book "How to Sell More Ranges."

Represented by

MONTGOMERY BROTHERS
911 Western Ave., Seattle, Wash.
2333 N.W. Westover St., Portland, Ore.
61 Fremont St., San Francisco, Calif.
420 S. San Pedro St., Los Angeles, Calif.
THE PETERSON COMPANY
1921 Blake St., Denver, Colo.
EDWIN L. WIEGAND CO.
7540 Thomas Blvd., Pittsburgh, Pa.

● THE GRAND LEADER DEPARTMENT store in Everett, Wash., has installed a new electrical appliance department and has placed Louis A. Cook, formerly associated with Puget Sound Power & Light Co. in Everett as executive head. He will be assisted by A. G. Kinney, Jr., who also comes from the power company in Everett, where he was with the Lamp Dept.

● G. S. SPANGLER, 618 Colorado Bldg., Denver, Colo., has been appointed representative for The Royal Electric Co., Pawtucket, R. I., in Colorado, Wyoming, Montana, Idaho and Utah.

● THE F. W. WAKEFIELD BRASS CO., Vermilion, Ohio, has doubled its manufacturing facilities to take care of its increased lighting equipment business.

● LEW F. MACDONALD, salesman for the MacDonald Electric Limited, Victoria, B. C., has, for the third successive year, won the Canadian General Electric Co.'s Washer sales contest.

● LEMMON & TRAVERS, electrical repair house, Reno, has moved to new and larger quarters at 323-325 Sierra Street. The firm has added Hugh Ash and Howard Haynes to their staff.

● LUMIDOR MFG. CO., INC., Alhambra, Calif., has appointed Arthur N. Neilsen as sales manager.

● DRIVER-HARRIS CO., Harrison, N. J. states that Nichrome wire is now stocked for the Pacific Coast trade by Angus-Campbell, Inc., with offices in Seattle, San Francisco and Los Angeles.

F. B. Connelly Co. Dedicates New Home in Northwest

During the week of Nov. 10, the F. B. Connelly Co., pioneer Northwest distributor, observed open house. The occasion was the formal dedication of the company's newly remodeled and greatly enlarged quarters.

This year marks the company's 58th year in business. Other Connelly establishments are located at Portland, Great Falls and Billings, Mont.

Senator F. B. Connelly, who was active in earlier Western political life, heads the company. Other officers of the organization's Coast operations are Kenneth Connelly, vice president, Frank Porter, secretary, and R. O. Driesbach, treasurer. Other department heads are H. A. Thomas, sales manager, O. E. Haydon, office manager, George Shephard, service manager, M. E. Kronmeyer, purchasing agent and Albert Witte, store manager.

The company's activities embrace the states of Washington and Oregon and Alaska. Eight salesmen cover this area in the company's service.

ABOUT PEOPLE

Westinghouse Personnel Changes Disclosed

Nathaniel H. Callard of Pittsburgh has been appointed manager of distribution apparatus in the Agency Sales Dept. of the Westinghouse Electric & Mfg. Co.

Callard was born in Portland, Ore., in 1892, and attended the Seattle, Wash., High School and the Univ. of Washington.

He joined the Westinghouse apprenticeship course in 1912. After a period in the Railway Sales Dept., he went to the Salt Lake Office as a salesman handling transportation and central station assignments.

In 1925 he was transferred to New York City on syndicate operations and was later appointed assistant to the Central Station sales manager of the company. Following 1928 he spent 11 years on the Pacific Coast as district central station manager. Last year he returned to Pittsburgh to undertake staff assignments in the General Sales Department.

W. Elbert Lee, graduate of Montana State College, has been appointed a sales representative for Westinghouse in Butte. Lee began his new duties at Butte on Nov. 5. He succeeded Richard C. Setterstrom, who has resigned his position with Westinghouse to join the industrial engineering staff of the Montana Power Co. For the past two years he has served as an assistant in the industrial sales section of the company's Pacific Coast District headquarters office at San Francisco.

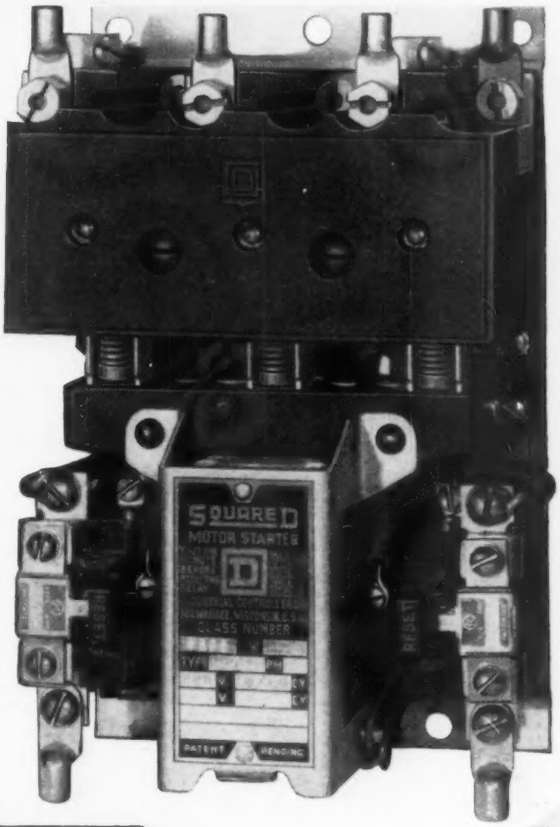
In his new post, Lee will handle company business matters and contacts with industrial and electric utilities users of electrical apparatus through virtually all of Central Montana, from Butte as far east as Miles City. He will make his headquarters at the Westinghouse offices in the Mayer Bldg., 129 W. Park St., Butte.

George Wesley Faurot, graduate of the Univ. of Washington and a native of Seattle, Wash., has been appointed a sales assistant in the Portland, Ore., offices of Westinghouse.

Prior to his Portland appointment, Faurot was sales assistant in the company's general sales department at East Pittsburgh. He joined Westinghouse in mid-1939, shortly after his college graduation.

● W. G. AKERMAN has been appointed office manager of the Westinghouse Supply Co., San Francisco.

A LINE OF STARTERS DESIGNED TO MEET TODAY'S REQUIREMENTS



DEPENDABLE. Electrically and mechanically these starters are built to withstand the severe service of high speed production methods.

EASY TO WIRE. Enclosing cabinets of all types and sizes provide ample wiring space. Sheet steel cabinets have knockouts at top, bottom, both sides and back. Cast metal enclosures have threaded conduit entrances at top and bottom. Terminals are accessible and clearly marked. Starter is wired in two colors for easy identification of control and power circuits. Thermal relays in plain view for checking current ratings.

ACCESSIBLE. All renewable parts can be inspected or replaced with minimum of time and labor. Contacts, springs and magnet coils are renewable without disturbing any line or load connections.

VERTICAL OPERATION. Straight line vertical action from magnet to contacts eliminates flexible leads, permits compact design and prevents accidental closing.

DOUBLE BREAK CONTACTS increase current rupturing capacity. Contacts are silver, non-corrosive and require no cleaning or dressing. Stationary contacts are interchangeable; movable contacts are removable without tools.

ENCLOSED ARC CHAMBERS confine such arcing as may occur. The higher rated contactors have magnetic yokes which act as blowouts—an exclusive Square D feature.

MAGNET. A modified "E" type construction gives exceptional pick-up and sealing characteristics even at low voltage. Two shading coils minimize magnetic hum.

For complete information write for new bulletin No. 137.

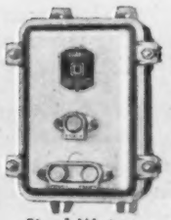
STARTERS IN SIZES UP TO 50 H.P., 440-550 VOLTS
MECHANISMS INTERCHANGEABLE FOR ALL TYPES OF ENCLOSURES

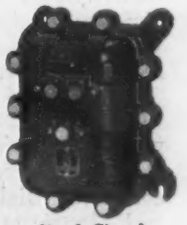
Size 2 General Purpose Enclosure

Size 2 Dust-Tight Enclosure

Size 2 Water-Tight Enclosure

Size 2, Class 1, Group D Enclosure


Size 1 Water-Tight Enclosure


Size 1, Class 1, Group D Enclosure

CALL IN A SQUARE D MAN

SQUARE D COMPANY

LOS ANGELES - MILWAUKEE - DETROIT

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

Terrell New Operating Manager of Puget Sound

Charles F. Terrell, for 10 years operating manager of Gulf States Utilities Co., Beaumont, Texas, took over new duties Nov. 11 at Seattle, Wash., as operating manager of Puget Sound Power & Light Co.

Puget Power President Frank McLaughlin, announcing the appointment, named Terrell also to fill the position of Central Division manager, succeeding the late Leslie R. Coffin.

Terrell began his electrical career in Seattle with the company whose operations he now supervises system-wide. His advance has been continuous. In 1922 after a series of promotions Puget Power transfered him to Bellingham, Wash., as superintendent of light and power in the company's Northern Division. In 1924 he went to Texas as light and power superintendent for El Paso Electric Co.; in 1927 to Florida as general superintendent of Tampa Electric Co.; after two years back to Texas to manage operations of Gulf States.

In his new position he has charge of Puget Power's whole system of generation, transmission and distribution facilities serving 19 Western and Central Washington counties.

● GEORGE EVANS, supt. of the Diesel plant for the U. S. Indian Irrigation Service, Coolidge, Ariz., has been appointed inspecting engineer for the Pearl Harbor Navy Yard.

● J. D. DONOVAN of Bend, Ore., was recently elected president of the board of directors of the Central Oregon PUD. Vice-president is Fred Shepard, Tumalo, treasurer, Joe C. Brown.

● J. HOMER SHAW, supervisor of commercial sales, Utah Power & Light Co., attended the recent advanced course in commercial lighting conducted by General Electric at Nela Park.

● W. J. HAMERSTADT of Rockwood Mfg. Co., Indianapolis, Ind., made a tour of the eleven western states visiting Rockwood Paper Pulley agents in the various cities.

● DR. H. T. PLUMB, General Electric consulting engineer, described scientific electrical wonders being developed in eastern research laboratories to members of the Salt Lake Kiwanians, Nov. 7.

● THOMAS INGLEDOW has joined British Columbia Electric Railway Co. as chief engineer. Ingledow comes to Vancouver from the Montreal Light Heat & Power Co., where he was assistant engineer, electrical department.

● G. W. LEATHAM, Price district supt., Utah Power & Light Co., was appointed by Governor Henry H. Blood to a selective service board last month.

Past Officers, Honored By Utah League

The Electrical League of Utah recently celebrated its "20th Anniversary Jubilee" when past officers of the association and old timers of the electrical industry of Utah were feted at the huge dinner-dance held in the Hotel Utah's Empire Room in Salt Lake City.

More than 180 electrical men and their wives were on hand and the League program committee, under the direction of Ora H. Barlow, presented a novel series of entertainments dramatizing various events and happenings in the League's history, featuring past presidents.

Past officers honored were: Jacob A. Kahn, who was largely responsible for the League's organization in 1920 and who served as the first president. Kahn is now district manager and vice-president of the General Electric Supply Corp., Salt Lake City. H. M. Ferguson, assistant treasurer of the Utah Power & Light Co. was honored as the organization's president in 1924; George R. Randall, Salt Lake Electric Co., 1926; B. E. Rowley, Edison General Electric Appliance Co., president in 1927; J. M. Perlewitz, now general manager of the railway and government department of Graybar Electric Co. in San Francisco, president in 1929; G. W. Forsberg, Wasatch Electric Co., 1930; C. A. Wolfrom, Utah Power & Light Co., 1931; L. E. Brown, Westinghouse Electric & Mfg. Co., 1932-1933; D. M. Salsbury, now district manager of the Westinghouse Electric Supply Co., Seattle, president in 1935; B. C. J. Wheatlake, General Electric Co., 1936; W. A. Huckins, Utah Power & Light Co., 1937; Will O. Smith, General Electric Supply Corp., 1938; J. Vernon Sharp, Sharp Electric Co., 1939.

Rose Named New G-E Head At Tacoma Branch

N. L. Rose, since Jan. 1, 1940, identified with the industrial division of General Electric Co. in Seattle, has been named manager of the G-E Tacoma branch. He succeeds the late Robert E. Lee.

Rose was graduated from the Ohio State Univ. in 1934 as a mechanical engineer. Following his graduation he joined General Electric at Schenectady. For the next two years, he worked in the test department, then served for one year in the motor and generating dept. at Fort Wayne, Ind., after which he returned to the industrial department in Schenectady, until his transfer to Seattle.

● L. O. FRYER, formerly Graybar sales manager at San Francisco, becomes a member of the General Sales Dept., as secretary to the General Sales Committee.

● PHILLIP RIVE, who has been field man with the Electrical Service League of British Columbia for the past three years, has now resigned that position following his appointment as a member of the electrical inspection staff for the city of Vancouver.

● J. P. FRASER has been appointed superintendent of hydro-electric plants by the British Columbia Railway Co.

● WALKER R. YOUNG, supervising engineer of the Central Valley project, has gone to Denver to be assistant chief engineer of the U. S. Bureau of Reclamation. According to chief engineer S. O. Harper, R. S. Calland, asst. supervising engineer will become acting supervising engineer pending the appointment of a permanent successor. Young had been in charge of the project for the past five years, having come from Boulder Dam where he was construction engineer.

Houston Promoted At Southern Calif. Edison

C. E. Houston has been elected vice-president and assistant general manager of the Southern California Edison Co., according to Harry J. Bauer, president. Houston has been assistant general manager of the company during the past year, and has been a member of the Edison organization for more than 30 years.

He began his career in the electrical industry with the Edison Electric Co.,

HOUSTON

Los Angeles, in 1904. After two years with this organization, he became superintendent of construction for the Ventura County Power Co. which in 1906 consolidated the electrical companies serving Ventura, Santa Paula and Oxnard.

He returned to Edison Electric in 1908, a year before the company name was changed to the Southern California Edison Co. He continued to progress in company affiairs, and in 1919 entered the commercial phase of Edison business by becoming district agent in Oxnard. He was district manager there, in Redondo Beach and in Pomona, remaining in the latter position for eight years. He came to Edison's general office in Los Angeles in 1932 as assistant commercial manager, and was appointed commercial manager four years later. He became assistant general manager in 1939.

Bakeman Elected President of New IES Chapter

C. T. Bakeman, commercial and industrial sales director of the Puget Sound Power & Light Co., Seattle, has been elected president of the newly-organized Washington state chapter of the Illuminating Engineering Society. Bert Hines of the power company, was named secretary-treasurer; George Boyd, Westinghouse, Bill Williams, Puget Sound Co. and Dr. F. A. Osborne, University of Washington faculty, were named members of Board of Managers.

● EDWARD M. BOGGESS is sales promotion manager at General Electric Supply Corp., Salt Lake City. A graduate of the Univ. of Kansas, he was formerly associated with General Electric offices in Schenectady.

● L. B. FULLER, chief engineer, Utah Power & Light Co., was special speaker at the Nov. 8 meeting of the Utah Section, American Society of Civil Engineers.

● JOHN LONGDEN, asst. manager, Westinghouse Electric Supply Co., Salt Lake City, presented a motion picture on salesmanship to members of the Salt Lake City Advertising club recently.

● RICHARD LAKE was recently elected president of the San Joaquin Power Club, succeeding J. E. Hammond. Robert Cleary was named treasurer.

● NORMAN L. BOST, Seattle head of National Electric Products Corp. has been elected president of the Electric Club of Washington. He succeeds Dan Chamberlin, of Globe Electric Co. New first vice-president is Tom Widrig, Trumbull Electric & Mfg. Co.; 2nd vice-president, Bert Cole, Graybar Electric; secretary, R. A. Walker, Puget Sound Power & Light Co. Charles Allison, long-time treasurer, was unanimously reelected to that post.

● CARL KELLY, PG and E, has been named new manager of the company's Rio Vista, (Calif.) branch. Larry Farrell, former manager, has been transferred to the Suisin-Fairfield office and will succeed George W. Lee, retired. Kelly was assistant to Lee in the Fairfield office for nine years.

● H. E. AHLSTROM, of Oakland, chief airway mechanic for the Federal Government, has been transferred to Treasure Island, San Francisco Bay, where he will superintend lighting facilities.

● HARRY P. EARL, credit manager of the Utah Power & Light Co. for the last 15 years, was appointed secretary-manager of the Associated Retail Credit Men of Utah last month. He is a past director of the National Retail Credit Assn. and president of the ninth regional district for NRCA.

● W. E. SPRACKLING, vice-president of the Anaconda Wire & Cable Co., visited his company's Pacific Coast offices last month.

● MILTON SANDERS has been promoted general sales manager of the Central Arizona Light & Power Co., according to A. F. Morairty, vice-president.

● THEODORE C. CIESLAK, formerly located at Bridgeport, has been appointed northwestern representative of the G-E Home Bureau, with headquarters at Seattle, Wash. Cieslak was manager of kitchen planning activities of G-E at Nela Park, Cleveland, before these were merged with the Home Bureau. His appointment followed a study of the western market recently completed by Arthur J. Lee, assistant manager of the bureau.

● E. O. "BILL" SHREVE, vice-president in charge of apparatus sales of the General Electric Co., has been elected president of the National Electrical Manufacturers Association.

● C. R. HORRELL, sales manager for the Sangamo Electric Co., Springfield, Ill., visited the Pacific Coast recently. He spent about four weeks in this region, including a week in San Francisco with L. A. Nott, manufacturers' representative there.

Deaths

Robert H. Hanna, electrical contractor, a member of the firm of Still Electric Co. of Burbank, Calif., was killed in an automobile accident while driving Warren Penn, Burbank manager of the Gold Seal Industries Co. to the National Electrical Contractors' convention at Jacksonville, Fla. Although shaken, Mr. Penn was not hurt and was able to deliver his address to the convention, describing the Gold Seal wiring program.

● R. EDWARD "BOB" LEE, manager of the Tacoma, (Wash.) office of the General Electric Co., and prominent in business, civic and sportsmen circles in Tacoma, died in that city on Oct. 23, following a heart attack. He was educated in Orting, Wash., where, after graduation from high school, he worked for the Puget Sound Power & Light Co. He was the first representative of the General Electric Co. in Tacoma, which opened an office in that city in 1914.

● WILLIAM E. CUNNINGHAM, 50, since 1932 Fresno district salesman for the San Joaquin Power Division of PG and E, died Nov. 1 in Fresno after a brief illness. He joined the company in Fresno in 1923 as a counter clerk, later becoming complaint clerk in the Fresno district manager's office.

● ELMER E. PECK, 77, widely known electrical engineer, who in 1895 was cofounder of a company regarded as predecessor of the present Southern California Edison Co. died in Denver, it was recently disclosed.

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PROFILES OF THE MONTH

D. H. Hutchinson, former manager of industrial sales for Utah Power, is now associated with Graybar Electric's Salt Lake City office

Lloyd F. Hunt, electrical engineer, Southern California Edison Co., has been honored as one of 13 outstanding inventors in that area

At the "polling" booth on the 10th tee, Lake Merced golf course, San Francisco, is the group of "voter-golfers" gathered for the annual tourney staged by the Electric Club of San Francisco. Left to right, they are Charles Meier, Rollo Cobban, Westinghouse; Ken Ryals, Stone-Ryals; Frank Angle, Allis-Chalmers; Harry Garbutt, Central Tube; Harold Noack, Hubbard & Co., and Ed Mahoney, Pacific Gas and Electric Co.

When S. F. Bay Cities section of IES was visited by Frank Hansen, newly-named Pacific regional vice-president (center), he participated in the inauguration of Ken Knopf (right), Westinghouse, as new section chairman, succeeding Nate Graves (left), of Pacific Gas and Electric Co.

Preview of coming campaigns by

P·G·and E·

ELECTRIC APPLIANCE SOCIETY OF NORTHERN CALIFORNIA

1940 ELECTRICAL GIFT CAMPAIGN

Again this year the Electric Appliance Society is putting on a bang-up electrical gift campaign for dealers throughout northern California.

And again the P. G. & E. is supplying the newspaper advertising—to the tune of nearly $15,000.

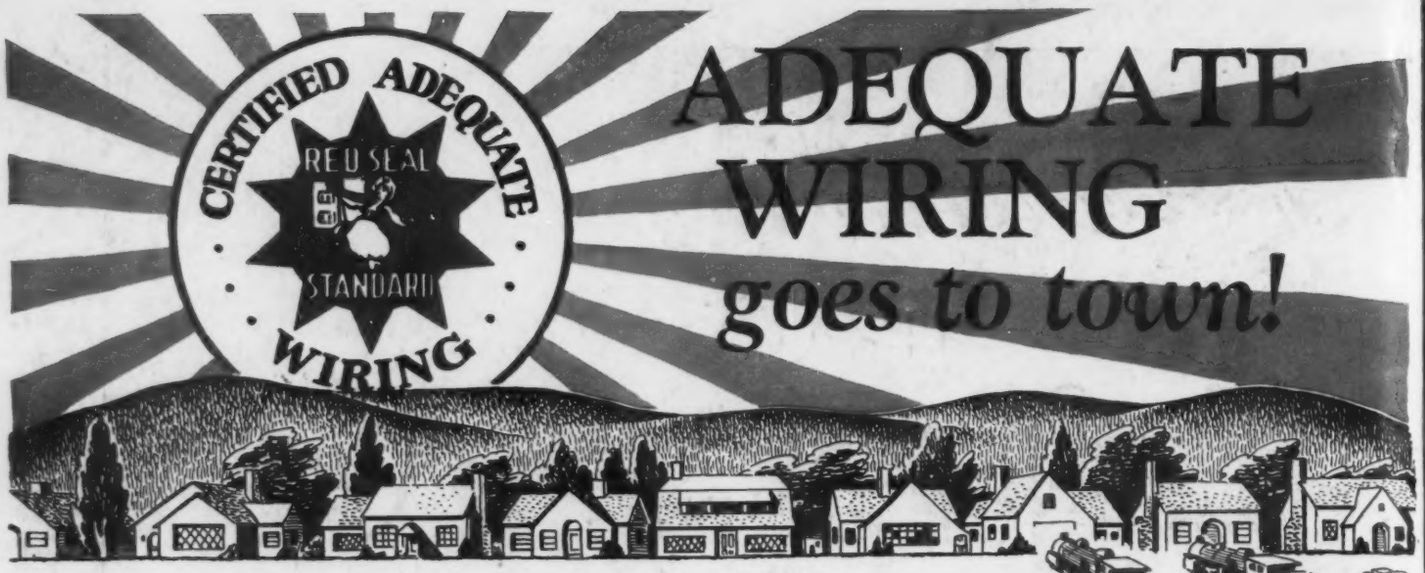
If you handle electric appliances you are probably on the Society's mailing list and know all about this great annual event; however, you may have been missed, in which case we suggest you call our local office immediately.

If you are located in the San Francisco Bay area you can phone the Society direct at HEmlock 6030.

DEALERS: By watching this page from month to month you can keep informed of sales promotional campaigns to be sponsored by the Pacific Gas and Electric Company and the Electric Appliance Society. Detailed information will be supplied, as usual, through the mail. If such information is not received, call our local office or write Electric Appliance Society, 1355 Market St., San Francisco, Calif.

EW 112-1240

ADEQUATE WIRING goes to town!



The end of 1940 will see the 20,000th Red Seal certificate issued.

So what?

So this! It means that in California there are 20,000 homes adequately wired —a city the size of Sacramento—a RED SEAL CITY! Each home rates a Red Seal certificate so we know each is adequately wired, and the owner knows it and can prove it with his certificate.

This city of 20,000 homes—some 80,000 people—is a "model" city for the California electrical industry. It offers an unhampered market for every new appliance as it is developed, and for continually increasing electrical service requirements.

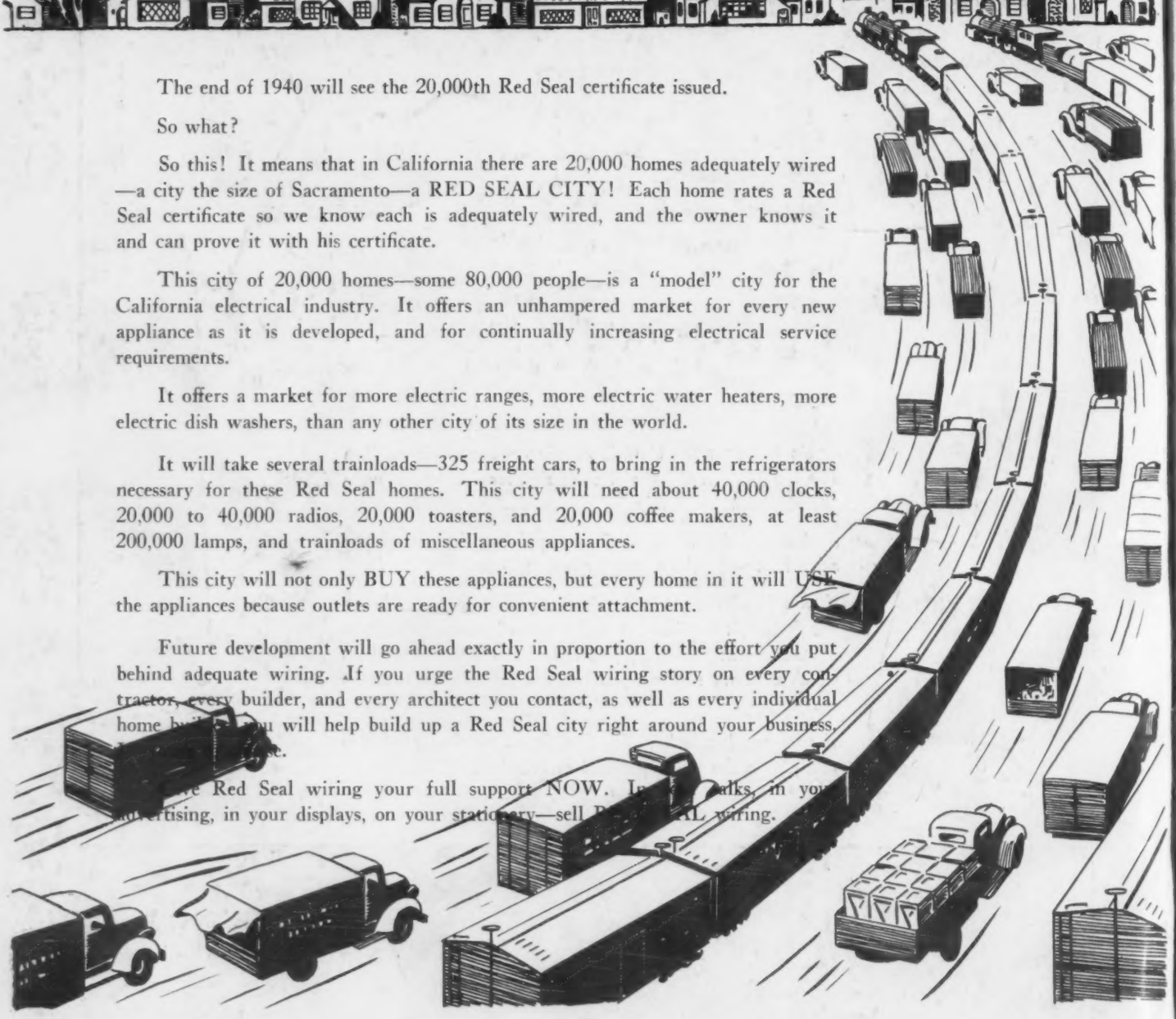
It offers a market for more electric ranges, more electric water heaters, more electric dish washers, than any other city of its size in the world.

It will take several trainloads—325 freight cars, to bring in the refrigerators necessary for these Red Seal homes. This city will need about 40,000 clocks, 20,000 to 40,000 radios, 20,000 toasters, and 20,000 coffee makers, at least 200,000 lamps, and trainloads of miscellaneous appliances.

This city will not only BUY these appliances, but every home in it will USE the appliances because outlets are ready for convenient attachment.

Future development will go ahead exactly in proportion to the effort you put behind adequate wiring. If you urge the Red Seal wiring story on every contractor, every builder, and every architect you contact, as well as every individual home b[illegible] you will help build up a Red Seal city right around your business, [illegible].

[illegible]e Red Seal wiring your full support NOW. In [illegible] talks, in your advertising, in your displays, on your stationery—sell [illegible]AL wiring.



PACIFIC COAST ELECTRICAL BUREAU

601 WEST 5TH STREET, LOS ANGELES • 447 SUTTER STREET, SAN FRANCISCO

12-40